ELP and
MAY 15, 1960

NEWS IN PERSPECTIVE

ECONOMIC CLIMATE

OPTIMISM seems to have replaced the doubts that were plaguing businessmen only a few weeks ago, despite the fact that inventories are tending to accumulate and manufacturers' backlogs are lower than they were last fall. Inventories have not yet touched their 1957 peak again.

REASONS FOR TURNAROUND are many. In part, it may have been sparked by realization that a stock market decline did not necessarily fore-shadow a depression and that the market remained at historically elevated levels. Furthermore, Congress, though bent on enacting many measures calling for spending opposed by the Administration, was not, it became clear, going to push the budget deeply into the red. Business stability, too, was an encouraging factor, indicating prosperity without boom and the attendant risk of a bust. In addition, signs of stability--or at least no further tightening--in Federal Reserve Fiscal policy have encouraged executives to become more expansion-minded.

CALL IT AN "AVERAGE YEAR," but, it looks like the best average year we may ever have, according to U. S. Steel's Chairman Roger M. Blough. He points out that 1960 never was destined to be the boom year some persons expected.

"PERPETUAL ECONOMIC MOTION" is not a law, GE's Chairman Cordiner warned in his remarks for the company's big annual shareholders' meeting, held this year in Chicago's Civic Opera House. Competition is going to be intense in the '60's, and we are going to have to work to get the business, he added. Only threat he sees to continued economic prosperity: loss of buyer confidence. One device to get big orders: new leasing arrangements "that help capital goods customers with their capital needs and smooth out the ups and downs in our income and workload," noted GE's Pres. Paxton.

MANAGEMENT VIEW

MERCHANDISING UTILITIES among combination companies are more aggressive than their non-merchandising counterparts, though this extra-aggressiveness is evidently not prevalent in the same proportion in the straight-electric companies. Westinghouse utility sales officials learned this in a survey of 170 investor-owned utilities. An edge in loadbuilding results goes to the straight electric companies in any case, though--the per-customer consumption of electricity averaging nearly 500-kwh more than among the combination companies.

A FIRM CAPITAL COST BASIS, for the first time, is reported to be the condition that induced So. California Edison to undertake the 360-megawatt nuclear power project--the first confirmed action on the proposals for 300-megawatt plants by California utilities, as reported to the Joint Congressional Committee by AEC's Chairman McCone. So. California Edison's Chairman Quinton notes that studies indicate that the plant could generate electricity at a cost competitive with conventional means. Said another So. Cal. Edison spokesman: "Before, construction would have been on a cost-plus basis. But now, enough is known about building atomic plants that companies can make concrete bids."

COMPLEX MANAGEMENT FUNCTIONS are growing more so, according to Commonwealth Services Pres. W. B. Tippy . . . and that's where the consultant comes in--more and more. The firm has prepared a new 40-page booklet to describe the consultant's role in business management and to "highlight the growing complexity of management functions."

Says the Commonwealth Services book: "Both large and small firms can use consultants temporarily to gain the competitive advantages of more comprehensive staff work." Among such advantages: an independent analytical approach, an objective view . . . and broadened horizons for personnel through contact with outside viewpoints.

UTILITY BUSINESS IN MEXICO is better as a government-operated development, while private capital is better off in industrial and commercial enterprises. Henry B. Sargent, president of American & Foreign Power Co., Inc., made this observation as his company sold its properties to the Mexican government for $65-million. "Under existing conditions in Mexico," said Mr. Sargent, "this is better for the Mexican people, as well as for our shareowners." The Mexican Subsidiary's president, David H. Matson, reported to "appear unworried for an official whose company had been nationalized," added: "it was a good deal all around."

THE ONE DEPRECIATION METHOD that regulated utilities can support, in the opinion of James K. Polk, is the price level basis adjustment calculation, which "adequately takes care of the inflation factor and truly matches the dollar of revenue with the dollars of expense." Mr. Polk told the recent National Conference of Electric and Gas Utility Accountants: the Congress is thoroughly considering this subject . .. and I urge you to give it careful study.

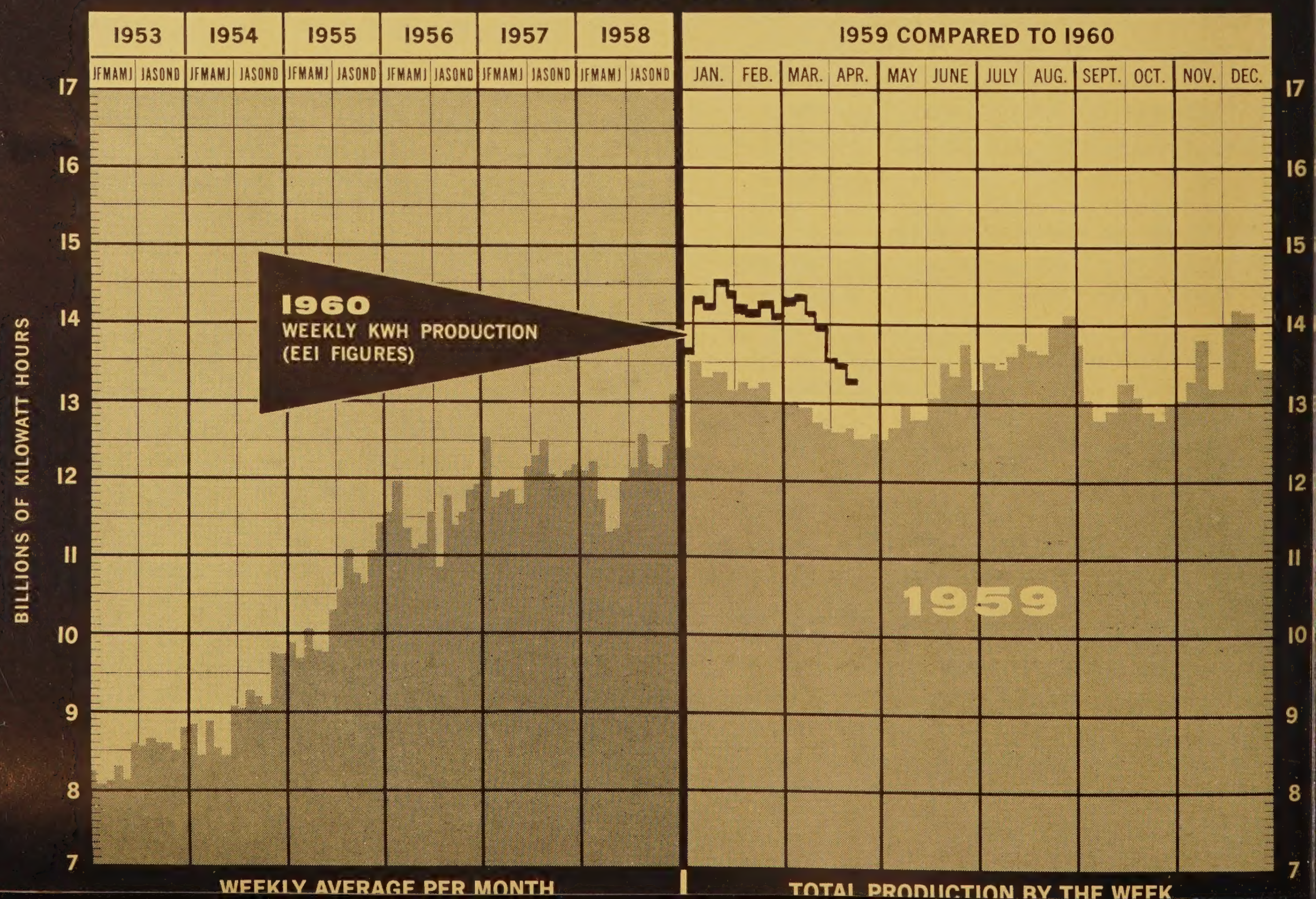
WASHINGTON INFLUENCE

NATIONAL WATER CRISIS, says the Senate Select Committee on National Water Resources, is bound to come "unless water resources development programs are reshaped to meet rising new problems." The senators point out that in most areas, the "key to adequacy" of water supply is dam and reservoir construction. They add that few river basins have anything like adequate capacity to meet regional growth needs.

Here's how witnesses view the problem:

Electric Utility Barometer

(Source: Edison Electric Institute)



NEWS IN PERSPECTIVE

STEAM-ELECTRIC PLANTS in 20 years will have developed a king-sized thirst, according to the Senate Select Committee on Water Resources. Some 260-billion gallons of water or more per day--about 2-1/3 times the average flow of the Mississippi at St. Louis or over 3 times present use--will be required. This amount is almost half the country's daily consumption. but only about one-percent is actually consumed in steam plants.

National power demands by 1980 were estimated by FPC for the Senate Select Committee as 388,780,000-kw peak. EEI's estimate was 501,000,000-kw peak. Projection given by the American Public Power Association was almost double that of EEI. The senators used the government agency's figures for their conclusions on water needs. FPC thinks steam plant power will triple by 1980 (to total 370-million kw) and that hydro generation will rise from 30-million kw to over 64-million kw. EEI thinks investor-owned steam plants will quadruple and hydro plants will double.

A-power growth by 1980 was not predicted by FPC, but EEI expects it to account for only 8-percent of investor-owned capacity. (AEC has given estimates ranging all the way from 10.8-percent to 58.6-percent of total capacity.) Water use by A-power plants is about equal to that of steam plants.

Present hydro capacity is but a fourth to a third of the potential total, Resources for the Future, Inc., feels. Further, it says that progress in hydro development technology may offset rising costs so that the ultimate limit of hydropower is not yet in sight.

REA estimated that the capacity of its generating plants would increase to 6-million kw by 1980.

NATIONWIDE SURVEY of water use in 1960 is being undertaken by the Geological Survey. The inventory will use special categories: (1) public supply; (2) self-supplied industrials; (3) steam-electric utility power plants; (4) irrigation; (5) rural domestic; and (6) water power.

$30-MILLION CUT in public works appropriations is advocated by the U. S. Chamber of Commerce. It asked Congress to call a halt to public spending on the following projects: Southwestern Power Administration; Southeastern Power Administration; the new TVA Melton Hill Dam and Reservoir; and TVA's fertilizer business. Private industry, said the Chamber, can do all these jobs without cost to the government.

TRIMBLE BILL "would lead to untold billions of dollars for construction of economically infeasible and fiancially unsound federal projects," an NAM spokesman told the House Public Works Committee. He pointed out that this comprehensive development bill "fails to declare a policy of natural resources development designed to encourage the private enterprise system."

COLUMBIA BASIN already has more than $1-billion invested by AEC in plant and equipment. Projects already authorized will raise this by another $500-million. AEC specialists told the Columbia Basin Interagency Committee that it is spending in the seven-state area at a rate in excess of $300-million a year.

DIVIDEND TAX WITHHOLDING, under investigation by the Senate Finance Committee, is being looked at thoroughly. Results of the inquiry to date indicate that the investigation is being conducted from the viewpoint of meeting possible objections that business may raise before any plan is submitted to Congress. Government figures that it can get another $400-million a year in taxes if honest reporting of dividend and interest income is enforced.

NON-FARM CUSTOMERS will outnumber farmers on REA lines by 1965, Administrator Hamil told the Senate Appropriations Committee. Hamil, in turn, was told by Sen. Ellender (D., La.) that REA should not venture into towns with (or approaching) a population of 1,500. Hamil noted that there was no such restriction in the law; however, in a statement for EL&P, (p. 81), he quotes the Act's definition of "rural area" as any area not having a population in excess of 1,500. (See story, page 79.)

"BLUE CHIP INVESTMENT" for the future, says Presidential aspirant Symington, is water resource development. He emphasizes multi-purpose projects.

INDUSTRY SIFTINGS

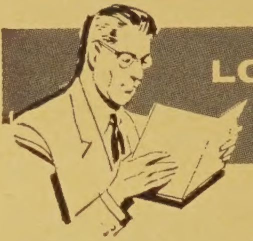
EQUIPMENT ORDERING RATE in industry markets is better this year, report several of the key suppliers to electric utilities. GE's Cordiner noted in a Chicago press conference the end of April that orders are running 8-9 percent above the '57-'58 low-ordering years. At Allis-Chalmers, incoming orders for electrical and mechanical apparatus are running 10-percent over '59 volume, building a $248-million backlog. Babcock & Wilcox reports a 9-percent reduction in order backlog since the end of the year, but incoming orders are running at double the first quarter rate.

(Implementing its new policy of publishing prices at current market levels, GE dropped book prices 5-percent on transformers 2000 through 7500-kva.)

WASHINGTON WATER POWER was allowed a rate of return between 5.75- and 5.9-percent by the Washington Commission, receiving an increase of $1.61-million, or 72-percent of the amount the utility originally requested. (For full discussion of this order, see "Regulatory Review" in EL&P, June 15.)

USE IS UP, PRICE IS DOWN--"Please keep this in mind when you read or hear about electric rates," ConEdison tells the public in a newspaper ad series. "Here are the facts," the message says.

NUCLEAR CONGRESS SKIPS '61, in a policy change (from annual sessions) that "reflects the current needs and interests of the engineering and scientific professions and the nuclear industry. Speaking for the Engineers Joint Council (sponsor of the Congress), B&W's Lauchlin M. Currie expressed the hope that more fresh material will be available after a two year interim . . . and that other organizations would help to minimize demands on those connected with the nuclear industry. (For report on the '60 Nuclear Congress, see page 86.)



LOOKING AHEAD... FINANCIALLY

--From Irving Trust

New money financing of $361,773,000 (60-percent electric) was the second highest since mid-1958.

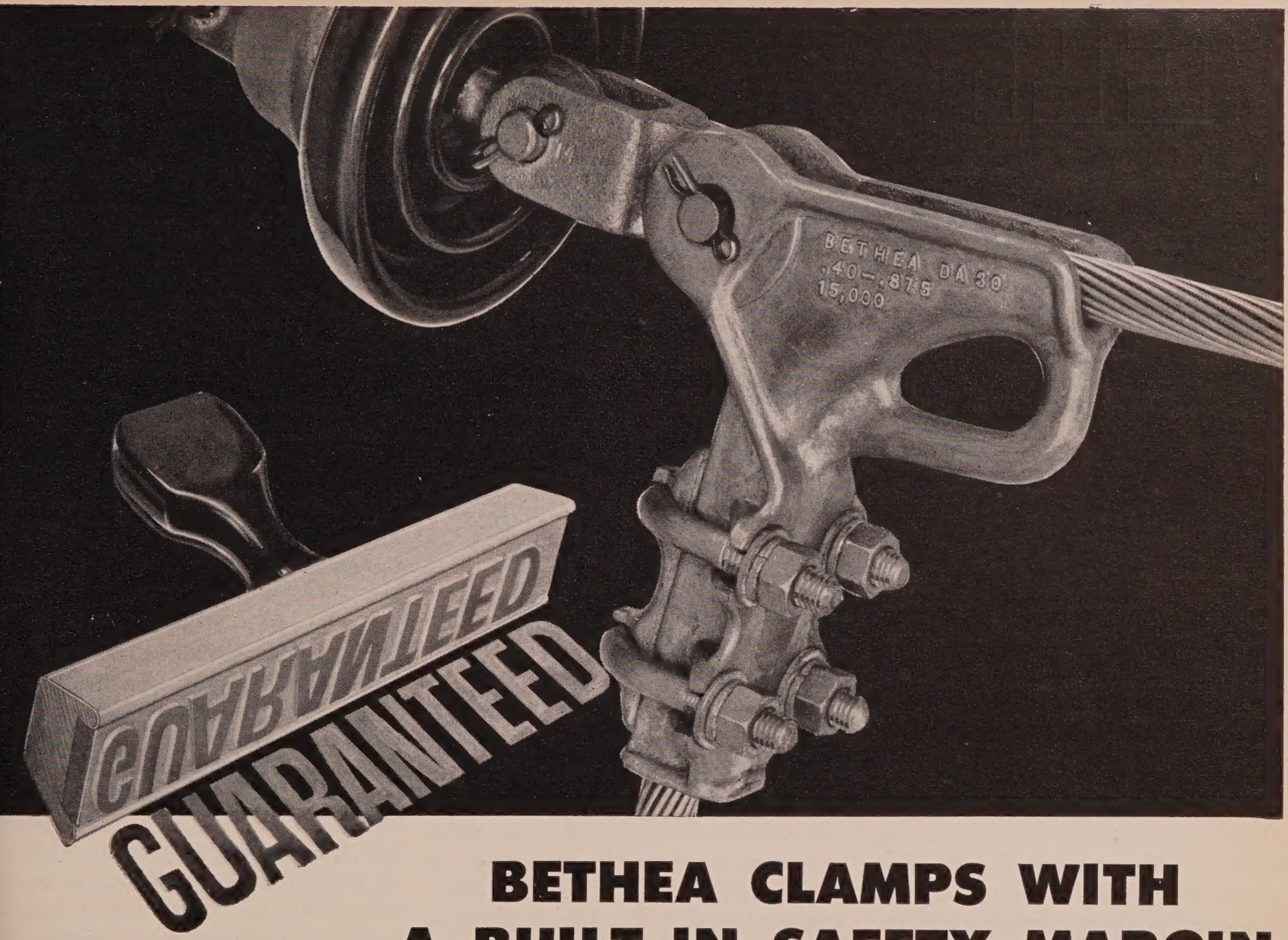
AAA-Two issues marketed in April. During the first week, $30-million of Commonwealth Edison (refunding protection until 1965) yielding 4.625-percent was poorly received and on April 19 the syndicate was dissolved. On the last business day of April, $30-million of Cincinnati G.&E. (no refunding protection) to yield 4.875-percent.

There were five common offerings in April. The largest being the $18-million rights offering of Wisconsin Electric Power, to yield 5.58-percent. Remaining issues were all sold directly to the public, the largest of these being the $16-million of Middle South Utilities, well received at a yield of 3.83-percent. West Penn Electric ($10,656,000) to yield 4.63-percent, Transcontinental Gas Pipe Line ($15,280,000) to yield 4.94-percent and California-Pacific Utilities ($718,000) to yield 4.73-percent, were also well received.

After a three month rise, prices on bonds moved downward, while prices on both preferreds and commons were mixed.

THE IRVING TRUST INDEXES SHOW:	Bond Averages	March 31, 1960	April 30, 1960
		% Yield to Maturity	
	"AAA"	4.49	4.55
	"AA"	4.50	4.56
	"A"	4.67	4.73

Stock Averages	Preferred—$ Yield		Common—$ Yield		Price/Earnings Ratio	
	3/31/60	4/30/60	3/31/60	4/30/60	3/31/60	4/30/60
	4.87	4.91	4.23	4.23	17.5	17.4
	5.03	4.93	4.39	4.41	17.6	17.6
	5.07	5.06	4.29	4.23	16.1	16.3

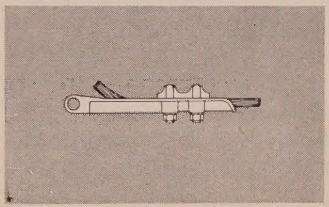


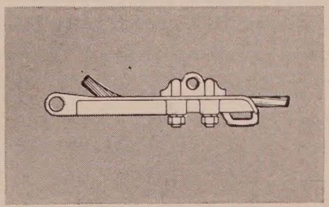
BETHEA CLAMPS WITH A BUILT-IN SAFETY MARGIN

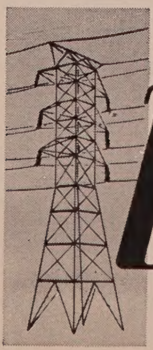
Millions of Bethea Clamps have been supplied to electric utilities in this country and abroad. All are designed, tested, produced and guaranteed to meet the most rigid industry requirements.

For example, Bethea straight dead end clamps offer unusual effectiveness and economy—for every application. From two U-bolt standard styles with superior holding power, to multi U-bolt "specials" for greased core conductors, all have been designed for easy installation and hot workability. Materials are 356-T6 aluminum alloy body and keeper, high strength steel hardware and stainless steel cotter pins.

A dead end for every general and special application—
Write for catalog and Pittsburgh Testing Laboratory Data.







1950 1960
10th YEAR
OF SERVICE

QUALITY CABLE FITTINGS

A BETTER WAY FROM . . .

Bethea
COMPANY, INC.

P. O. BOX 1407 — BIRMINGHAM, ALABAMA

In A Kansas City P. & L. Case

Utility Wins over Employees On "Unfair Labor Act" Plea

A recent labor relations case dealing with employee seniority rights, decided in favor of the Kansas City Power & Light Co., is of significant interest generally and specifically to the utility industry.

A Missouri court decided (Miller vs. KCP&L Co., C.C.H. 39 Labor Cases 69,200, Missouri, Feb. 1, 1960) that certain seniority rights of two employees had not been violated and that they could not recover from the utility.

The two KCP&L employees had sued for reinstatement in jobs from which they claimed they had been displaced by their employer and for damages for an alleged breach of a collective bargaining contract.

For many years, contended these employees, they had worked under a collective bargaining agreement that among many other provisions, established seniority rights. Another member of this bargaining unit had been promoted to a supervisory position and several years later transferred back to this unit.

At the time of his promotion his seniority was less than that of these employees, but, since the supervisor continued to accumulate bargaining unit seniority, KCP&L maintained he had the right to "bump" and displace both of these employees.

One of the defenses of the company to this action was that these circumstances described an unfair labor practice over which the state counts had no jurisdiction or control and that this offense, outlined by these employees, was governed by the provision of the federal labor law that, "It shall be an unfair labor practice for an employer . . . by discrimination in regard to hire or tenure of employment of any term or condition of employment, to encourage or discourage membership in any local organization."

The Missouri court said, "They did not plead or allege that the discrimination complained of in their petition was done 'to encourage or discourage membership in any labor organization' or that the employers' action was inspired by any conduct of these employees in commerce connected with their union membership or by any other activity in which they have been engaged.

"Conduct that constitutes a breach of a collective bargaining agreement is not for that reason alone an unfair labor practice. Proposals to make breach of contract an unfair labor practice were before Congress when it enacted the Taft-Hartley Law but were specifically rejected by the Conference Committee on the ground that once the parties had entered into an agreement enforcement should be left to the usual processes of the law and not to the National Labor Relations Board."

To this the court added, "Although the National Labor Relations Act in its original form and as maintained by the Labor Management Relations Act, recognizes the right of employees to bargain collectively through unions, it should be noted that no provision of the act confers upon an individual employee the right to enforce his rights under a collective labor agreement action."

Middle West Service

Pension Plan Survey Shows Utility Uses

A career-type pension plan providing for retirement at age 65 with no annuity maximum specified is the most dominant kind in electric utility practice today. A survey of 94 major utility companies, just completed by the Middle West Service Co., disclosed the extent to which these and other features have been adopted in the industry's pension plans.

All plans specified a retirement age of 65 for men, and 76 plans used the same age for women (with 17 plans specifying age 60, one age 62). In 80 of the plans there is no maximum annuity, while an amount is specified in the other 14 plans.

Employee contributions are involved in 51 of the plans, but not in 43. There is a provision for vesting in 66; none in 28 of the plans.

Other features appeared less frequently in the descriptions recorded by the Middle West study, although there were a number of definite preferences revealed in the tabulations. A summary of other data compiled by Middle West follows:

FUNDING	NUMBER OF PLANS
Insured	34
Trusteed	53
Insured and Trusteed	7
ELIGIBILITY	
Immediate	12
Age only	5
Service only	26
Age and Service	50
Age or Service	1
TYPE OF PLAN	
Career Type	79
Supplementing Soc. Sec.—69	
Deducting Soc. Sec.—10	
Final Earnings Type	14
Supplementing Soc. Sec.—12	
Deducting Soc. Sec.—2	
Variable Annuity Type	1

REA—25 Years Old Now—Has Controversial Past . . . Promises Co-ops Healthy Future

RURAL ELECTRIFICATION: "R E A COMES OF AGE . . ."

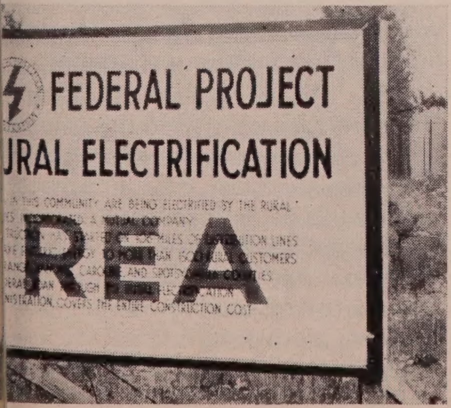
"REA has 'come of age,'" the Secretary of Agriculture has said.

With an anniversary last week, the age of the Rural Electrification Administration is now 25. Remarkable growth and success over this quarter-century is acknowledged by all, supporters and critics alike. And, there are many of each view and a few shades between . . . for one thing the REA program has not outgrown is controversy.

Secretary Benson's remark about growing up was pointed: "In the interest of fairness to all," he said, "and in the interest of its own future financial strength, the system should pay interest rates at least equal to the cost of money to the Government . . . and then start moving forward to obtain supplemental financing from private sources."

Such actions, promised the Secretary of Agriculture, "would eliminate one of the criticisms of REA . . . and a criticism that will increase unless a change is made."

Today, criticism of the REA program ranges from mounting objection to this favored financing position (See "Co-op Profiteering at Taxpayers' Expense . . ., " EL&P May 1, 1960, page 33) to increasing concern for the extent to which co-op competition for non-farm load has been growing.



But, any way you look at it, the REA program has come a long way in the 25 years since Pres. Roosevelt's Executive Order 7037 set up the depression-time emergency relief agency, which only a few months later became something closer to the "bank" that it remains today.

Here's what the REA program looks like in 1960:

- Well over $3-billion has been spent building the rural electric lines . . . and a market for consumer goods created by the program has brought about sales in excess of $12-billion for appliances and electrical equipment.
- REA borrowers' net worth is more than $600-million ($602-million on Jan. 1, 1960), some 18.2-percent of their total assets; and REA borrowers, by 1960, had made principal and interest payments of more than $1-billion to the government.

Most REA-financed co-ops got an early start, so that the "typical" REA borrower today is 22 years old. Locally-owned and locally-managed, it serves nearly 5,000 meters located in parts of three counties. With a net worth of $630,000, it has borrowed a total of $3.5-million (in several loans from REA), repaid in principal and interest about $1.2-million—about $150,000 ahead of schedule.

Rural KWs—Before and Since the REA

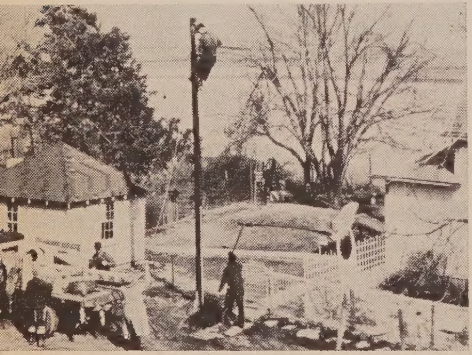
In 1960, electrification of rural U. S. is nearly a saturation accomplishment, insofar as service to the nation's farms is concerned. (Only Sweden, Denmark and France preceded the U. S. to this high degree of coverage.)

Even with the remarkable growth of the REA-financed co-ops, though, all credit for rural electrification cannot be given to the REA program—far from it. And, here's where controversy over the REA becomes most heated.

Of all farms receiving electric services, about 43-percent (in 1958) are served by investor-owned com-

Pre-electrification down on the farm—rough on the housewife, here heating flatirons on the wood-burning range . . .

More questions about REA program were answered in schoolhouse meetings than in any other place . . .



Says REA: Thoughtful crews discussed location of poles with each home owner before digging holes . . .

NEW MEMBER - NEW OWNER
REA CO-OPS ARE MEMBER-OWNED AND CONTROLLED

First Co-op offices were simple affairs, often set up in renovated Main street stores or warehouses.

panies; and in addition, 40-percent of the electricity being distributed by REA co-ops is being supplied to them (at wholesale rates) by the electric companies.

The most provocative question is: How would rural electrification have developed *without* the REA?

An extremist among REA supporters (like Oklahoma's Rep. Carl Albert, for example) can, and does, contend that "if this job had been turned over to the private utilities, it would not have been finished in a thousand years."

The record, going way back to pre-REA days, begs to differ.

REA protagonists argue two points particularly: (1) the private power companies wanted little part of the unprofitable job of running power lines to the remote and scattered farms of America in the '20s and '30s; and (2) with the establishment of REA, they still held back, making no real move to pick up the government's challenge in the form of $100-million loan fund set up by Congress to launch farm electric development under the then newly authorized REA.

But, the electric utility industry claims this record of interest (and action), going back before the turn of the century:

- Some U. S. farms had been electrified as early as 1898, and a first survey by a committee of National Electric Light Assoc. showed 177,561 electrified farms by the end of 1923. By 1933, electricity had been made available to probably more than a million farmers, and although only about 713,000 actually accepted this service, this represented more than 15-percent of the total of all farms electrified today.
- Through good times and bad in the years since, electric utilities have contributed as many or more dollars than even the U. S. Dept. of Agriculture to support farm electrification research. (In 1960, power companies are participating in more than 200 farm research projects, according to EEI.)
- Slowed down in The Great Depression, expansion of rural electrification was far short of what utility men and farm leaders had hoped for, with the farmer's lack of purchasing power the chief obstacle. The job had just got started on a large scale before the depression, utility men advised the Roosevelt Administration in the fall of 1934 . . . and renewal of farm programs was planned for 1935.
- Since 1933, the utility industry had indicated willingness to cooperate with a plan to provide long-term financing at lower interest rates than private capital could provide. When this resulted in the birth of REA, and Administrator Morris L. Cooks asked the power companies to submit a nationwide program for putting the $100-million to work in rural electrification, such a program was proposed: In fiscal 1935-36, 79,000 miles of new rural lines for serving some 286,000 customers.

"Preference" Thwarts Private Utilities

The 1935 proposal of the private companies was never acted on by the REA, according to an EEI history ("Rural Electrification in the U. S.," released early this year). In July of 1935, Administrator Cooke announced that preferences for REA loans would be given to "applications from municipalities and other agencies of the state and to non-profit associations such as cooperatives." Though investor-owned utilities would be allowed to apply for loans (in contrast to the original legislation which did not permit this), preference was to be given to governmental units and co-ops, so that in practice, few investor-owned companies could borrow from REA funds. (See box on page 83.)

To this day, the investor-owned utilities maintain they have a keen interest in bringing more of the benefits of electrification to America's farms. In addition to their research activities, there are some 400 other company-sponsored activities aimed toward more effective electric service on the farm, together with numerous related development and promotion programs.

EEI's Managing Director Edwin Vennard recently stated the private power companies' position this way: "Obviously, there are differences between REA cooperatives and power companies—largely in the tax treatment and method of financing. But there are many areas in which we have a common interest—principally in the field of sales. Let us try to expand our working together in

Administrator Hamil: REAs Feel Obligated to Serve ALL Unserved Rural Persons . . .

As the REA program reaches its 25-year milestone, the concept of its future role takes on new interest. With this in mind, EL&P asked Administrator David A. Hamil to respond to this key question: How far is it proper for *rural* electrification to expand . . . and what is the extent to which expansion of the REA-financed systems is "fair" competition with investor-owned systems?

Mr. Hamil expressed this viewpoint:

"Since the end of World War II, rural electric systems financed by REA have been adding new consumers at a rapid rate. An estimated 139,000 new users were added to REA-financed power lines during 1959, and in the continental United States, five out of six of these new consumers were non-farm consumers.

"At the same time, existing consumers increased their use of electricity, boosting demand still higher. According to early estimates, farm consumers on rural lines consumed an average of 4,200 kilowatt-hours of electricity in 1959. The average for all consumers rose to 5,200 kwh for the year, up from 4,720 kwh the year before.

"The increase in the number of rural consumers and the demand for more power are signs of profound changes taking place in rural America. There are more commuters, suburbanites, retired people on rural lines. There are new rural business firms, industries, mines and processing plants.

"The Rural Electrification Act, which is the statutory authority for REA, permits REA loans to be made for the purpose of financing the construction and operation of generating plants, electric transmission and distribution lines, or systems for the furnishing of electric energy to persons in rural areas who are not receiving central station electric service. The Act defines "rural area" as any area not included within the boundaries of any city, village, or borough having a population in excess of 1,500 inhabitants. The term "rural area" specifically includes both the farm and non-farm population thereof.

"If they are to stay in business, REA borrowers must continue to meet the growing demand for power in their service areas. As new families—or new businesses—move to areas served by REA-financed systems, the systems should make every effort to serve these newcomers. REA will continue to make loans to assist its borrowers to increase system capacity to meet the rising demand.

"As demand increases, many REA borowers will face a continuing problem in finding suitable sources of wholesale power. In the matter of generation and transmission loans, it is an REA policy of long standing that it will approve G & T loans only under the following conditions:

1. When no adequate and dependable source of power is available in the area to meet the needs of the distribution system; or
2. Where the rates offered by existing power sources would result in a higher cost of power to the system than the cost from facilities financed by REA.

"In summary, most REA-financed electric systems are expected to grow in the years ahead, both in the number of consumers they serve and in the average amounts of power they deliver to each consumer. These systems are primarily interested in serving rural areas, and they feel it is their responsibility to make every effort to serve all unserved rural persons, whether farmer, suburbanite, or industry. They also feel there is and will continue to be plenty of business for everybody. Occasionally, they and other power suppliers seek to serve the same loads. Who serves them, in our opinion, must be a matter for local determination. In many instances mutually satisfactory arrangements have been worked out for service to such loads. This is an old and acceptable way of doing business in America."

his field. There is much to be done n research, planning, promotion and advertising—where we can help each other and the farm customers."

All electric utility industry executives cannot agree wholeheartedly with this position of "peaceful co-existence" with the REA co-ops, however. Nor do the co-ops return he compliment, with any unanimity at least.

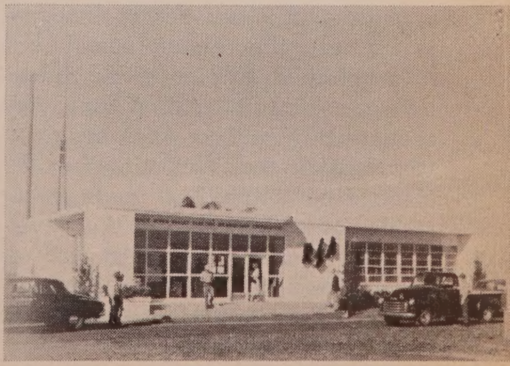
Hostility of REA supporters toward private power goes way back, of course. They readily concede that he most significant thing about the early development of the REA was he simultaneous development of public power . . . that it was not by accident that the same George Norris who fathered the first REA bill also fathered the TVA.

In the years since, the REA program has been pushed relentlessly, as a spearhead of the public power movement, by a number of "great champions." Since 1942, when the National Rural Electric Cooperative Association was set up, dedicated organization and leadership of the public power extremists have drawn a sharp and uncompromising battle-line. For example, at its most recent annual meeting, NRECA officials told the membership:

"In the years ahead . . . a continuing public relations program will be increasingly important to successful operation of rural electrics. Politicians will listen first to majority urban voters who are getting sick and tired of reading about "pampered farmers" and high government payments in the field of agriculture. With only 11-percent of the people of this country aware today of the true ownership of America's Rural Electric Systems, it is imperative that we lose no time in

(Continued on page 83)

Today, Co-op headquarters are handsome . . .



Pacific P. & L. Co. Denied Rate Increase By The Washington State Commission

Proposed $1,000,000 (or 9.5%) increase turned down.

Trended Fair Value Rate Base not considered by Commission.

Exclude plant acquisition adjustments in Original Cost Rate Base.

The Commission indicated clearly in the preliminary discussion of the case that it would give no weight to their own statutes prescribing Fair Value for rate making purposes. It said in part:

> " . . . it clearly appears that the Commission is not required, as a matter of law, to give weight to so-called current value in arriving at a just and reasonably accurate rate base."

The Commission's general position on its objection to trended Original Cost is as follows:

"(1) Inadequate consideration is given to the fact that the existing plant of the utility would not be reproduced in its present form and location.

"(2) Obsolete and outmoded items of property are cost-trended to present day prices, with the end result that it poses little or no competence as an indicator of the present value of this property.

"(3) There is little to recommend the use of cost-trended figures for items of plant that no one would or for that matter could reproduce or replace.

"(4) No consideration whatsoever is given to the substitution of a plant of modern design incorporating all the technological improvements in efficiency and reduction of costs of operation that have occurred since the existing plant was constructed. We know that the electric industry has made great strides over the years in the development of new and improved apparatus and equipment with resulting savings in capital, operating and maintenance costs.

"(5) No consideration is given to the fact that modern new construction equipment is now available, nor to the increased productivity of labor.

"(6) No consideration is given to the mass construction of the property and thus the dollars as trended to the higher price level incorporates within itself piecemeal construction practices and outmoded construction methods."

The Commission seems to have ignored the fact that the question of whether a plant is going to be replaced or not is immaterial and irrelevant to the whole theory of the fair value rate base. Even if none of the plant is to be replaced, the owners can only be made whole through the receipt of income reflecting current cost and current market conditions as compensation for property being consumed in public service at today's prices.

As to the Commission's injection of the substitute plant theory, little if any weight has been given by any Commission to this method of arriving at a present fair value rate base. The reason of course is that it is speculative and conjectural, and even if a determination can be made, it is unfair to the extent that all the benefits of technology would flow to the customers and that the owners of the property would have no advantage whatsoever. Curiously enough, the Commission apparently does admit that fair value exists at least for certain portions of the Company's property. In dealing with the question of automobile pricing wherein the Company's witness used trended value, the Commission notes in part:

"We do not understand how such property as an automobile can have a present value to the utility for rate making purposes which is in *excess of its replacement cost on the open competitive market.** Apparently the witness has an understanding of present value which is at odds with the generally understood meaning of that term."

If the Commission in effect admits that fair market value exists for automobiles, then why not for the rest of the property? The Commission then tries to impute elements of fair value to the rate base by saying:

"Notwithstanding, it now suffices to say that to a very large extent at least the higher price levels prevailing since the end of World War II are already reflected in the company's plant records of original cost. 58.35 percent of the company's plant in this state has been constructed in the past five years."

It should be noted that the argument that if enough plant is put in at current dollars, then by some extraordinary and yet undetermined manner the utility will arrive at a current fair value rate level. Nothing could be further from the truth, as is witnessed by the fact that the Handy-Whitman Construction Cost Index (1911 = 100) for hydro property in the Pacific Northwest increased from 483 in 1954 to 591 in 1959, indicating an erosion of 18-percent in the value of the property even in that short period of time.

Electric Plant Acquisition Adjustments

The Commission excluded from the net investment rate base Electric Plant Acquisition Adjustments in the amount of $1,096,000. It said in part:

" . . . the staff contends that even assuming commensurate benefits have been shown, the acquisition

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*Italics supplied.

(Continued from page 82)

adjustment amounts primarily flow from acquisitions which occured 25 to nearly 50 years ago, represent intangible values not physical properties, and that amortization thereof not only should have been, but has been accomplished through adequate rates from the ratepayers.

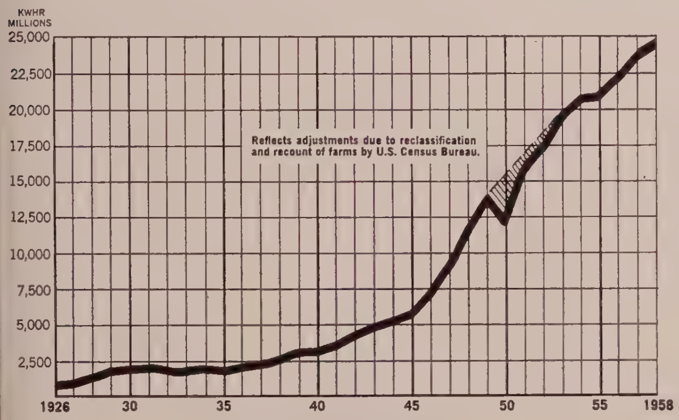
"The fair preponderance of the evidence does not show that commensurate benefits have accrued to the ratepayers from the acquisitions at issue *or that full recovery of the acquisition adjustment amounts has not been had by the company.** We are of the opinion that the staff's proposed rate base treatment of Account 100.5, Utility Plant Acquisition Adjustment, should be adopted for rate-making purposes."

The Commission is in error when it infers that the Company had recovered these acquisition costs through amortization. Both in the case of the Federal Power Commission and the Washington Commission the amortization of Account 100.5 (Plant Acquisition Adjustment) has been at the expense of the stockholder by annual charges to Account 537 which is a below the line account. It is clear therefore that the Commission has in effect made the stockholder pay twice for such acquisitions, first, at the time the property was acquired, and second, by making him pay for the cost of the amortization.

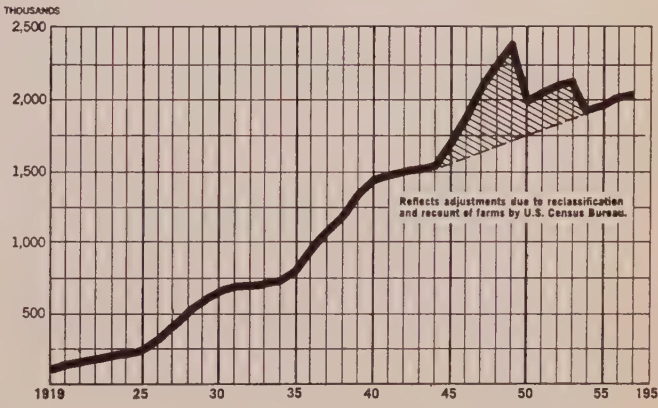
REA LOANS TO PRIVATE POWER companies? They have been made, though not in recent years, and there is little likelihood that additional loans will be received by the Federal agency in the future.

Of over 1000 electric borrowers from REA, 24 have been private electric companies (mostly small outfits operating in outlying areas), which have received a cumulative total of $20,067,000 in loans.

Private companies are still eligible for REA loans. They must show, however, that it would not be economically feasible, under available private financing terms, to build the facilities proposed for extending service to rural customers.



FARM KILOWATT-HOUR SALES
(Total Electric Industry)



FARMS SERVED BY ELECTRIC COMPANIES

(Continued from page 81)

keeping America informed as to who we are, what we do and why we must grow and expand."

NRECA's role? What is probably the most potent weapon in NRECA's arsenal was defined simply in these terms: The only way you can continue to operate an adequate and efficient public relations program is to do it on a national level . . .

Yet, many co-op managers feel they have plenty to do right at home . . . and they are doing it. (There are 37 statewide organizations composed of rural electric systems in these individual states.) And, more and more, through active roles in resources development and community progress programs, they are exploiting their potential on the local level.

Granted many of their problems are in the area of "public relations," the co-ops have others:

- Sustaining the earlier interest in co-operatives—many of the long-term, early-day co-op board members are "aging" (a big concern of NRECA officials relative to the Association's future) . . .
- Keeping within the proper role of the REA-financed co-op—"The sole purpose," as Mr. Hamil says, "—to enable all rural people to get central station electric service."
- Providing, in fact, the service called for in the covenant written in REA loan contracts—"to make a diligent effort to serve the widest practicable number of consumers." (In 1959, REA found that only about one-third of its electric borrowers accomplished "true area coverage," with no increase in minimum rates and no requirements for special contributions.)

Of course, as problems and handicaps go, many would say that the co-ops have as their own worst enemy, the NRECA Director, Clyde Ellis. Few would be sure about just where he would stop in his ultimate effort to equate REA goals with those of public power extremists.

For now, though, the Administration presents a brake on expansionist efforts of this kind. Promises Secy. Benson: "This Administration will continue to support and strengthen the services of REA *to farmers*. We will just as vigorously oppose efforts to socialize electric power or any other segment of our economy . . ."

The future of rural electrification is bright—all agree. Says REA: More farm uses for electricity—many of them spectacular—are on the horizon. An infinite number of rural industries and businesses are starting each year. REA estimates that by 1963, the average consumer on co-op lines will be using 7000-kwh; by 1975, 14,400-kwh. And, the number of consumers served by REA-financed systems will swell to 4.9-million by 1963; to 6.2-million by 1975.

Yes, REA has "come of age . . ." Yet, there seems to be more room for maturing, in more ways than one.

short term vs. the long look

No utility is about to lose interest in the invoice price of coal. But as the power needs . . . and the resulting coal needs for the next ten and twenty years shape up in every operating area . . . short term thinking is giving way, more and more, to the *long look*.

Utility engineers and purchasing agents are asking themselves and their coal suppliers some pointed questions: "Can we count on these suppliers to deliver the kind and quantity of coal we're going to need in the years ahead? Have they adequate reserves? Is this coal costing us over and above its invoice price in excessive coal handling, ash handling, equipment outages, freight charges on inerts? Or is it coal that eliminates these frequently overlooked incremental costs, delivers highest operating efficiency and steam at the lowest cost?"

The answers you'll get to such questions from Island Creek are the kind that let you plan ahead with confidence. Our engineers would welcome a chance to sit down with yours for a thoroughgoing discussion. Write, wire or phone.

You can depend on Island Creek . . . a career company dedicated to coal

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by RALPH ELLIOTT
Washington Editor

Fuels Policy Via Administrative Law?

The U. S. Supreme Court has agreed to give the answer to a question in the field of natural gas regulation that has attracted the interest of a good many electric utility people: Is the Federal Power Commission's authority under the Natural Gas Act broad enough to thwart a power company's proposed use of natural gas, purchased directly from producers, to fire its generat- ng plant boilers?

In a case involving Consolidated Edison Co. the Commission asserted hat Edison entered into contracts with producers for the purchase of natural gas in two Texas fields. Then it made an agreement with Transcontinental Gas Pipeline (Transco) under which the latter would transport the gas for delivery o Edison in New York. Edison had greed not to resell any of the gas; t was to be used solely to fire two f ten boilers at the Waterside plant n order to abate a smoke nuisance.

The Commission grasped the mat- er under its certificating authority, nd on the basis of broad policy onsiderations refused Transco the ertificate necessary for interstate ransportation service.

Edison's proposal, FPC held, would: stimulate competition in the eld purchase of gas and thus drive p prices; pre-empt pipeline capac- y which otherwise would be available "to meet more urgent and idely beneficial public needs;" nd toward the freezing out of maller gas purchasers; and result an "inferior" end-use. Moreover, e Commission noted, if it ok'd e proposal "we would soon be onfronted with many requests of e same general character."

This FPC decision was reversed y the U. S. Court of Appeals in hiladelphia. Striking down each the Commission's reasons for ocking Edison's plan, the court said: "Our conclusion . . . is that the Commission has gone beyond its authority in denying the certificate here. We think that what the Commission has in effect done is to assert, by its examination and disapproval of the end use to be made of the gas, a general allocation and conservation authority over the natural gas fields of the United States."

The court went on to say the Commission had repeatedly sought from Congress, but had been denied, the very allocation and conservation powers it attempted to assert.

Regarding FPC's holding that the proposed use of the gas "is something less than desirable," the appeals court noted that there was "plenty of evidence" that Edison was confronted with a "difficult problem" resulting from the huge fly ash and sulphur dioxide discharge from the boilers in question. Then it had this to say:

"More serious, however, is the assumption which the Commission makes that the proposed use was 'inferior.' It is true that the gas . . . was not to be sold and it was established that it was to be used to fire boilers. But these boilers . . . generate power for electricity and make steam for heating. We do not see that using gas to make steam to heat an apartment house is inferior to the use of gas to heat a single family residence whether by steam, hot water or whatnot. The cases the Commission had here were not those of the use of gas for industrial purposes only. There was involved also the use of gas in a step for space heating and lighting. That factor was completely ignored by the Commission so far as its opinion reveals."

It was this decision of the appeals court that the Supreme Court agreed last month to review. Argument in the case will be heard during the Court's term beginning next October, with no final decision likely before mid-winter.

The Government's petition for the high court review warned that the appeals court decision, if left standing, would have "very serious consequences" in that it "would permit a vast, new, unregulated, interstate market for gas—by industrial enterprises purchasing for their own use—side by side and competing with the regulated market over which the Commission currently exercises jurisdiction."

Edison's opposing brief contended the Government's fears were "demonstrably exaggerated." It further declared that Edison was motivated by "continued and increasing pressure" from the City of New York and thousands of people in the area of the Waterside plant to alleviate the air pollution situation. The case embraces numerous "unusual circumstances," the brief added, and "presents a unique factual situation that it is unlikely will again recur."

Noteworthy is that last year FPC turned down Southern California Edison Co.'s proposal to buy substantial volumes of gas from the interstate pipeline serving California markets. The gas was to be used under SCE's boilers as a means of alleviating the smog situation in and around Los Angeles. Since then, SCE has been shopping around in producing areas with a view to obtaining its own supply.

No doubt the cases where electric utilities will find it feasible—economically or otherwise—to acquire and utilize natural gas reserves for boiler fuel will be few and far between. But many of them are more than casually interested in the outcome of the Transco-Edison case, primarily from the standpoint of how far the FPC can go toward the establishment of a national fuels policy via administrative law.

Reports in 1960 Nuclear Congress . . .

Stress Need for Large-Size Atomic Plants; See Promise in Advanced Reactor Systems

Size is a concept that gets a lot of consideration in the field of nuclear power today. At the 1960 Nuclear Congress in New York City last month, "size" was a very prominent consideration.

Generally, the size of the still-struggling nuclear business was a frequent and familiar topic. While the measure of this was inconclusive, size in terms of nuclear powerplant planning was more definite and, perhaps, more significant . . . at least to the electric utility industry.

(For the first time in several years a "management" program was not arranged, as in the past by the National Industrial Conference Board, to coincide with the Nuclear Congress; however, "economic" and other management considerations continued prominent in many of the papers presented in technical sessions of the Congress . . . and EL&P reports briefly on the more significant of these.)

Large central station nuclear powerplants have been the subject of the AEC's most detailed studies and projections, for example, as the Commission's top reactor development specialists noted in their presentation to the Congress. In offering the latest description of the Commission's year-old plan for "Reactor Development in the Next Ten Years," Frank K. Pittman and U. M. Staebler reiterated some conclusions about future actions which had been summarized in first publication of the study details in mid-February. (See accompanying timetable.) In this presentation, no reference was made to a specific target date for prototype construction of a sodium-cooled fast reactor, whereas the initial AEC summary in February had mentioned the possibility of a design start on a 100-megawatt prototype by 1963 or 1964.

Messrs. Pittman and Staebler indicate that an average annual expenditure of about $200-million will be needed to carry out this development program. Most of the expense will be the government's, though "industry's contribution will be substantial and at an increasing rate," they observed.

Drs. Pittman and Staebler emphasized that the AEC evaluation is "not a one-shot effort, but a continuing study." Current conclusions are subject to revision and additional conclusions will be forthcoming, they indicate, noting that "i will be necessary to make periodi redeterminations of current statu and potential of the different con cepts."

On the basis of present plant now authorized, a total of almost 1400 mwe can be on the line by the en of 1964, most of it in the 1960-6 period. "Because of this situation few new developmental projects ar to be initiated in the next tw years," they noted, adding: "Th estimate of total installed nuclea capacity could be greatly influence by the developments of the nex four or five years."

Bechtel's W. Kenneth Davi asked: Will we have nuclear powe units that will be competitive wit conventional units of 500-MW larger—a size range that may n be uncommon in 10 years or so?

"This can become an importa factor in the future of nuclear pow er and must be considered now. W must not be reluctant to conside ever increasing sizes of units an find ways to achieve them. This a pears to me to be the princip virtue of superheating for wate cooled reactors," said Mr. Davis.

"Today, proposed nuclear powe plants of 300 mwe are regarded being very large, perhaps approach ing the limit for certain types of r actors. By the time such units ca be put into operation such a siz for conventional units will be ver common, particularly on those sy tems having favorable conditio for use of nuclear power—larg

Nuclear Congress leaders at the speakers' table for the opening general session included (l to r): Dr. John R. Dunning of Columbia Univ.; Dr. Clarke Williams, conference chairman; Dr. W. H. Zinn, of Combustion Engineering; and Dr. Lauchlin M. Currie of Babcock & Wilcox.

rapidly growing systems with high fuel costs and high system load factors. Nuclear power will have little advantage from the point of view of size under these circumstances.

"I have been impressed by the willingness of the Russians to consider and tackle large size units, whether they be tractors, dams, or rockets. Perhaps we can learn something from them in this respect that will help us in meeting the challenge of size."

For an apparent preoccupation with economics of most scientists and engineers in the nuclear field, Mr. Davis suggested the substitution of an even greater "cost consciousness." Much of this can come only through experience, which is not gained rapidly, he conceded.

An aspect of cost consciousness Mr. Davis considers of particular importance is "time." At present nuclear powerplants take substantially longer to design and construct than do conventional plants, with schedules extended mostly to accommodate long delivery items, he noted.

"There will be a significant reduction in the cost of nuclear units when the over-all design and construction schedule is reduced to an optimum schedule comparable to that for conventionally fueled units," Mr. Davis predicted. "While the longer schedules prevailing today are, at least in part, due to the unique character of nuclear units and lack of experience, there are still more fundamental problems involved in achieving the necessary schedules. The solution of these problems requires imaginative engineering in all phases of the work —design, manufacturing, and construction," according to the Bechtel vice-president.

Summary of "Future Plans" in AEC's 10-Year Reactor Development Program

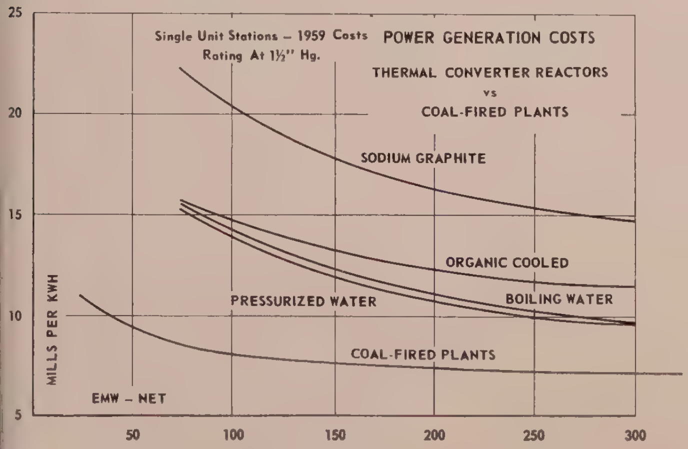
Reactor Type	Next New Project
Pressured Water Reactor	In 1962 — Start design of next generation of Yankee-Indian Point concept
Boiling Water Reactor	By 1963-64 — Review progress; but, no new construction contemplated until then
Nuclear Superheat Organic-Cooled Reactor	In 1963 — Possible initiate design of 100-megawatt prototype By 1965-66 — Utilities might construct a 300-megawatt unit in high fuel-cost area; a 50-100-megawatt prototype might be built to demonstrate further improvements
Sodium-Cooled Fast Reactor	By 1963-64 — Design start on 100-megawatt prototype
Enriched Gas-Cooled Reactor	By mid-'60s — 100-megawatt prototype could be initiated
Heavy Water Reactor	By 1966-67 — Feasibility evaluation can be made
Aqueous Homogenous Reactor	In 1962-63 — Experiment may be built
New Concepts	In next few years — Of some 9 or 10 new ideas for major improvements in existing reactor types, some 3-5 are expected to reach a point where construction of experiments may be justified

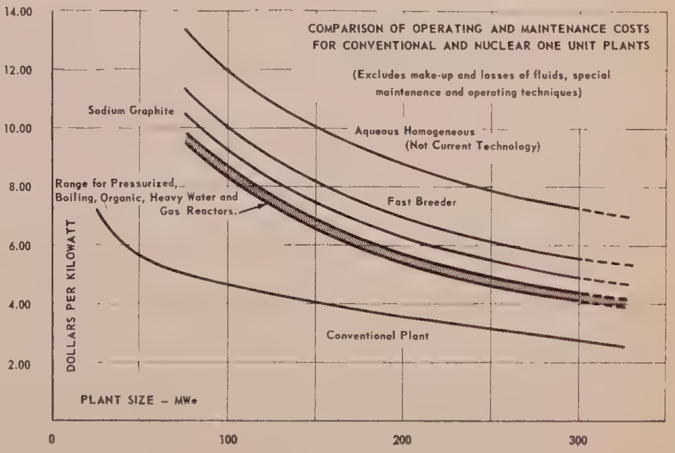
Assess Advanced Reactor Systems

In a session on "Advanced Reactor Systems and Fuel Cycles," the economic potential for water reactors, as well as for the high-temperature, gas-cooled, graphite-moderated reactor, was described as "promising" and supported by the representatives of Westinghouse, General Electric and General Dynamics who delivered papers in this well-attended presentation.

The evolution of water reactor systems indicates that higher efficiencies and resultant lower fuel costs and capital costs will soon be a reality, according to W. E. Shoupp and J. H. Wright of Westinghouse, in a paper delivered by the latter. From the potential improvements shown to be possible, a continuation of a large-scale development effort in advanced water reactor systems is adequately justified, they maintain.

"The next important step in water reactor development is the construction of an advanced closed-cycle water reactor plant utilizing forced circulation," suggested the Westinghouse representatives. "The 330-MWe closed-cycle water reactor represents such a plant and possesses many potentials for utilizing further improvements in the fuel cycle." (Referred to as a "fourth generation" reactor, the 330-MWe plant, with an output of more than three times that of the Yankee plant, could be developed with "a





ublished recently in a supporting document (SL-1674) of the AEC's tudy of the Civilian Power Reactor Program, these curves indicate osts for nuclear versus coal-fired plants. Power generation costs for e thermal converter reactors are compared (at left) with a coal-fired plant, based on an 80-percent load factor and 14-percent for fixed charges. Nuclear costs include a uranium use charge of 4-percent, with a plutonium credit of $12 per gram; while the coal fired plant costs are figured on a fuel cost of 35-cents per 10^6-Btu.

Session on Advanced Reactor Systems at the Nuclear Congress was followed by this informal discussion of a condenser reheat cycle. W. E. Shoupp and J. H. Wright (at left) presented a joint paper, J. Lee Everett of the Philadelphia Elect. Co. was session chairman, and David Rose of General Dynamics Corp. (at right) was a speaker. Mr. Wright noted in his paper that efficiency improvement from condenser reheat is "marginal"; yet, use of it is sometimes justified.

modest extension of present technology," they asserted.)

The Westinghouse authors spoke of the 10-Year AEC Reactor Study as a "bench-mark", observing that the study conclusion indicating that a closed-cycle reactor type is not practical represented a real "challenge." According to the authors, the technical problems associated with these advanced closed-cycle concepts are somewhat in direct relationship to the core outlet enthalpy; and, it is reasonable to assume that such designs are feasible through a well-directed research and development program.

Direct-cycle nuclear superheat is rapidly emerging as possibly the chief contender for producing superheated steam cycles, they pointed out. "It seems reasonable to assume that nuclear superheat concepts can be developed which will give an overall plant efficiency of 36-percent or higher," said Mr. Wright. "A closed-cycle reactor of the fourth generation technology, and the advanced dual-cycle reactor have an expected plant efficiency of about 30-percent. If the potential of nuclear superheating can be realized without markedly increasing the capital costs, a major part of water reactor development will be in this area," he predicted.

Representatives of GE's atomic power equipment division (Messrs. Zebroski, Horst and Aline) detailed an exploratory study of large superheat reactors, concluding that the present cost of nuclear power could be reduced about ⅔-mill per kwh in superheat units—"a saving that could prove to be very important in areas where there is presently only a narrow gap between the cost of nuclear power and that generated by conventional power systems."

Calculated advantages in the fuel cost cycle are not in themselves sufficient to establish a decisive incentive for nuclear superheat, according to the Zebroski paper, but the total savings are significant when the fuel cost cycle advantages are combined with plant capital cost improvements. The General Electric engineers also reported: (a) it does not appear practical at present to superheat the secondary steam nor to use reheat for the primary steam; and (b) there appears to be little or no incentive for superheat temperatures higher than 1000-F.

David Rose, of General Dynamics' John Jay Hopkins Laboratory, reported that the pursuit of economical nuclear power in the form of gas-cooled power reactors has produced a continuing interest in operating on a much larger scale (than the 40-MWe prototype HTGR plant to be owned and operated by the Philadelphia Elect Co.) "It is in this area that the special characteristics of this class of reactor are felt to offer the greatest attraction," he noted. "Fuel cycle costs as low as 1.5-mills/kwh and capital costs of $250/kwh appear entirely attainable for the larger plants,"

The General Dynamics representative also indicated that the HTGR goes far toward the ideal of incorporating a maximum degree of safety as intrinsic features of the design, rather than by elaborate auxiliary devices.

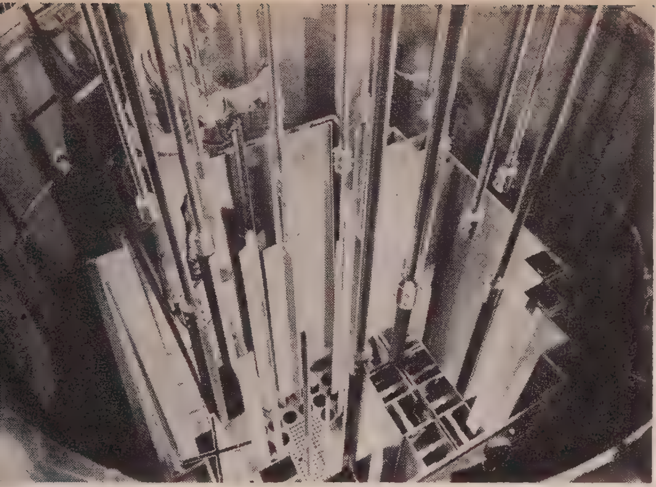
Instrumentation Advances Needed

An AEC representative, Frank C. Legler, reported the results of a Commission survey showing that, before economic nuclear power can be realized, numerous developments and improvements in instrumentation and control are needed. His paper was delivered in a session on "Progress in Reactor Instrumentation."

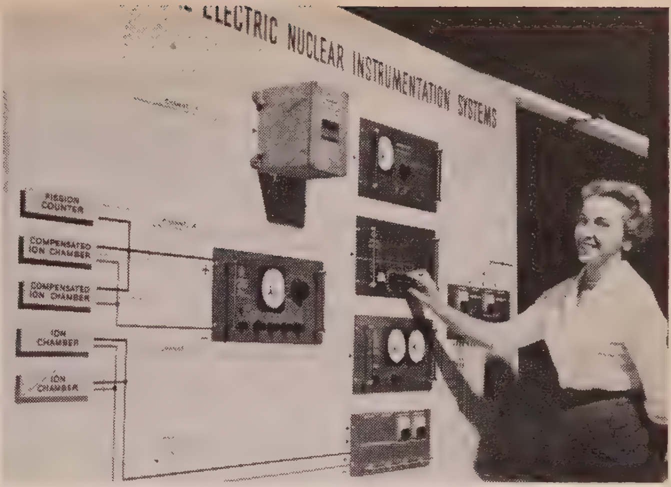
Among many requirements in both neutron flux and non-nuclear instrumentation, Mr. Legler included a variety of ionization chambers, sensors and counters, as well as new methods for calibrating and checking instruments in inaccessible places. He reported other needs in the area of reactivity control, and such closely associated requirements as the need for standardization of instrumentation specifications.

In this session, GE Engineers Ogle, Hendon and Forster declared that the only practical way at present of measuring and regulating the performance of large power reactors is offered by in-core control and instrumentation systems. They referred to the in-core instrumentation of the Dresden Nuclear Power System as typical of the kind being planned for other large boiling water reactors.

The Dresden system of 64 neutron-sensitive ionization chambers and 16 activation wire thimbles (for periodic checking and calibration) measure neutron flux rather than temperature, the GE engineers pointed out. The advantages of this measurement were listed as: (1) greater simplicity and economy, (2) the signal is more suitable as a safety system initiator, because it is not delayed by any thermal time constants, and (3) the operator is provided with a continual picture of the flux distribution in the reactor, permitting him better manipulation and more effective programming of the control rods. Information is also available to be used in planning of the fuel element movements during



t Nuclear Congress Atomic Energy Show in the N. Y. Coliseum, Allis-halmers exhibited a model of the Pathfinder plant, for which this itical facility reactor (left above) is providing valuable physics data eeded to achieve optimum power design. A-C is building the nuclear ower plant for Northern States Power Co.



General Electric exhibit at the Nuclear Congress showed how instrumentation and controls system for a larger nuclear power reactor operates. Light system and artist's representation of the plant layout showed visitors how control affects plant operation. More than 150 firms and organizations exhibited at the N. Y. Show.

efueling, they added.

Discussing "Requirements of Intrumentation and Control for losed-Cycle Water Nuclear Power lants," C. F. Obermesser of Westghouse, said that an acceptable nstrumentation system "reduces etrimental consequences of a startp accident to a purely hypothetical oncept. For a startup to occur, hen, there must be a series of mulple failures in the nuclear instruentation and scram system; and t the same time, there must be ontributory gross errors or neglience on the part of the reactor perators."

Safety measures must be simple, oolproof and absolutely certain in peration, Mr. Obermesser noted, if uclear powerplants are to comete successfully with more conentional installations. He also bserved that the prevalent philosohy that nuclear reactors must be upersafe has engendered designs f the supersafe variety. The desire o protect the reactor and operating ersonnel is so strong, in fact, that uplicate and even triplicate rector instrumentation systems are enerally provided.

Containment, Disposal, Recycling

Alf Kolflat of Sargent & Lundy ummarized the "Results of 1959 uclear Power Plant Containment ests" conducted at the Hennepin ower Plant of Illinois Power Co. esults of the test "were very disouraging insofar as the integrity f the containment vessel was concerned," and the test equipment was damaged to such an extent that it was not practical to contemplate a future test, he disclosed. However, he reported, the test "again demonstrated that cold water in the containment would greatly reduce the pressure, even when action is as close to instantaneous as in this case. These tests convinced us that there was a possibility of drastic reduction in the size of containment shells and corresponding reduction in cost."

Dr. B. M. Johnson, a senior engineer for General Electric at the AEC's Hanford, Wash. plant, reported that the answer to the search for lower cost and more effective waste disposal may be radiant-heat spray calcining. In the Hanford laboratories' chemical research operation, studies are now being conducted on this method of reducing liquid wastes to a powder or into a solid clinker-like material. The change from liquid to a solid mass reduces the volume of the waste by a factor of 12, a reduction that could provide major savings in the cost of storing atomic wastes. The waste is reduced by a factor of 2.5 to 3 in volume when it is changed from liquid to powder, he reported.

Another GE engineer at Hanford, Roy E. Dunn, predicted that "the recycling of plutonium may permit the recovery of far more energy than currently being realized from a given quantity of uranium." The widespread use of plutonium through return as enriched material to uranium-fueled reactors could influence almost all power reactor concepts, he added.

An important tool in the program, the Plutonium Recycle Test Reactor (PRTR) now under construction at Hanford, is expected to be operating at design power later this year. Before this, PRTR loading tests are to be performed with seven different fuel configurations, according to Mr. Dunn.

Atomics International engineers, Messrs. Spencer, Bley, Burkhardt and Haroldsen, indicated in a paper that operation of the OMRE and the Piqua prototypes "have further demonstrated the simplicity and workability of the organic-moderated reactor concept." Proven means for controlling decomposition high boiler products have been demonstrated, assuring economic coolant makeup costs. Engineering designs are now available for organic-moderated reactor power stations from 11.4-MWe to 300-MWe size, they reported.

An Ebasco representative, Joseph A. Klapper, called for cooperation from designers, builders, manufacturers and operators of nuclear reactors to accelerate efforts of the ASA Advisory Committee on Nuclear Piping to fill the need to cover nuclear piping with a code for minimum safety. To accomplish this, machinery has been established for: advising the Code of specific needs, presenting as much data as possible when requesting case decisions, and offering revisions to the Code as technology advances.

PCEA-PCGA Speakers Stress Good Relations, Identify Right-of-Way Needs, Insurance Problems

Major problems facing gas and electric utilities? Many of them can be found within the scope of the needs for good relationships in a host of matters involving the public . . . and for acting as a good neighbor in the conduct of utility business.

William E. Johns, associate attorney for the Pacific Gas & Electric Co., emphasized these areas in surveying the current crop of "major problems for utilities" at the recent annual joint Administrative Services Conference of the Pacific Coast Electric Association-Pacific Coast Gas Association.

The importance of relationships with the public has been increased in recent years as the California utilities have endeavored to assure the state of a continuing and increasing hydrocarbon energy supply from out-of-state sources, Mr. Johns noted. As the transportation of gas across county, state and international boundaries is contemplated, we are imposing problems on others which arise out of our problems, he said, and it is essential that our relationships be maintained on a basis which permits them to accept these burdens with some understanding of the necessity for so doing.

"Our thinking (as attorneys) must be conditioned by the need for good relationships in a host of matters involving the public, such as zoning, the extension of service, smog control, relocations to accommodate governmental projects, taxation, and so on," Mr. Johns observed.

"Sometimes it seems that technological developments to promote efficiency in our industries tend to increase the problems rather than solve them. Construction of high-pressure large-diameter gas pipelines, for example, seems to the landowners to impose a much greater burden than the small-diameter low-pressure lines which used to run from gas manufacturing plants through a purely local system. The same thing is true with regard to the high-voltage electric transmission lines.

"As a result there is an attitude on the part of many people that while they recognize we perform a necessary and useful service and provide a most desirable commodity, they would much rather we did it by going somewhere else with our major installations. The public and its representatives are conditioned in large part in their attitudes toward our companies by the respect we show for their welfare in the location, design, construction and operation of our facilities.

"We might properly say that the problems arising out of obtaining the basic commodity of our business and transporting it to the market are normal risks of the business. The success we have in meeting these problems will depend in large part upon the attitudes we have engendered in the public and in public agencies by the way we go about conducting our business. If we demonstrate we are capable of conducting our business as a good citizen in the various communities where our facilities are located, we should immeasurably improve the willingness of the public to attempt to understand our problems and support our efforts to solve them," concluded the PG&E attorney.

Predicts New Accounting Efficiency

Merle J. Wardenburg, of the Arizona Public Service Co., presented a progress report on auditing electronic systems. Auditing results on computer systems can be greatly enhanced by system design that enables mass checking on all data, either by the Auditing Section or on department levels, he indicated.

"We can increase the efficiency of our accounting systems as has never before been possible (by utilizing) the ability we now have through computers to insure that input information is more correct than ever before, and by using mass sampling techniques to perform internal audits, said Mr. Wartenburg.

From his own company's experience he listed these projects, completed or planned, which were handled as auditing functions, though they were not necessarily originated in the Auditing Section: (1) listing meters inactive six months or more—(showing account address and numbers and meter numbers); (2) listing residential accounts with electrical consumption greater than 1500-kwh; (3) checking demand rates to kw field; (4) load factor check; (5) rate comparison to FPC classification and area location; (6) test for valid labor charges; and (7) hours comparison on time reports vs. distribution reports.

Foresee Right-of-Way Changes

Right-of-way engineering methods were reviewed in a discussion by a panel that included C. H Bischoff, H. V. Jachel and D. A Heape of the So. California Edison Co. Mr. Heape reported that many short cuts, other than photogrammetric methods, have been adopted to meet right-of-way engineering problems. He noted the usefulness of such instruments as portable calculators, two-way lightweight radios, as well as the use of plastic drawing surfaces for making plane table surveys.

According to Mr. Jachel, among the major changes in equipment and methods of surveying expected in the next decade, aerial surveying will be used more and more extensively and electronic measuring devices such as the telurometer will be generally accepted.

A. V. Cocking, president of Aerial Control, Inc., predicted that i is very likely that within the nex ten years we will see the time wher this work will be done by an electronic computer which is connected directly in line with a stero-comparator.

"Instead of the present optical mechanical method of solving th photogrammetric problems the electronic computer will do the job for us. At the same time it wil reduce electronic information tha is received from the field by radio automatically make the necessary coordinate transformations and punch out a tape possessing coordinates of points of interest. All of th necessary technical equipment ha already been designed, and it requires now only the application and the coordination of this equipment to produce this," said Mr. Cocking

Jack W. Frost, Right of Way Agent, Field Supervisor for Pacifi as and Electric Company, noted hat for years he has been preaching the benefits of utility corridors with a multiple purpose use, to be wned in fee. The cost of the fee oday will be less than the cost of n easement tomorrow, he oberved. There is a limited market or rights of way today; there will e no market tomorrow.

Mr. Frost also proposed the folowing: Should we not have joint tility and planning boards of state ide scope and authority to review ur mutual plans and problems? If ; is logical for local planning gencies to designate green zones, ndustrial zones, commercial zones, nd virtually every other type of one, then should they not reserve tility zones for our transmission eeds? Should not the private utility, like the Federal agency, have he right of immediate possession?

Mr. Frost had additional advice o offer about appraising:

“Should we be dependent on the utside or specialist appraiser, hould we use staff appraisers, or hould our agents be skilled in the ppraisal process and technique nd, therefore, fully equipped to ngineer an agreement with the and owner or the counsel for the and owner? At Pacific Gas and Electric Company we maintain that, with the exception of a rare or unusual situation, it is the fundamental duty of the agent assigned o the project to determine values n a manner satisfactory to the job upervisor prior to making the initial call. We, therefore, rely on the complete” brand of agent, and we emand that he equip himself to do complete job. True, we have our pecialists; our fee acquisition section, our timber and forestry section, our men who handle the ppraisal and disposition of impediments falling within the proposed ight of way; and we have our gents assigned as laison men between right of way and law departments, who are responsible for the iring and schooling of outside appraisers as witnesses when preparing for trial. We maintain, however, hat the backbone of our profession s the properly trained and quipped right-of-way man.”

E. C. Ritchie, asst. mgr. of PG&E's aluation dept., delivered an opening paper for a session of the newly organized administrative services section of the PCGA-PCEA. He observed that the compilation of any unit cost cannot be considered as any exact science, but rather as a work of art, reflecting very definitely the education, experience and motivation of the person in direct charge of their development.

The purpose for which unit costs are being developed is an important factor in our choice of the method we would use in compiling them, said Mr. Ritchie. Also, there are many items and variations that can be used in our analysis of records when such records are used for the compilation of basic data.

Mr. Ritchie listed five major components which could represent the increments of cost that make up a total unit cost for an installed item of property: (1) Direct material costs; (2) Indirect costs attributable to materials; (3) Direct labor costs; (4) Indirect costs attributable to labor; and (5) General overhead costs attributable to or spread on the basis of all prior costs.

Atomic Energy Liability

Frederick W. Mielke, Jr., attorney for PG&E, reported that several legislative changes have been proposed because a number of problems are encountered when attempting to apply tort law to the radiation hazard involved in atomic energy liability. The questions are:

Is strict liability to be applied? If so, to what extent? Should it apply to all radiation . . . to all persons involved with it? Are defenses such as assumption of risk or contributory negligence to be allowed? Can causation be established for more subtle effects of radiation injury, or will these effects be considered speculative and unprovable? When should applicable statutes of limitation start to run? Who should be liable, and in what proportion, for cumulative injury from radiation? Should the burden of proof shift in any respect?

T. R. Salm, general auditor of the Pacific Gas & Elect. Co., called this the most important recent development in fire insurance:—The fact that excess fire insurance is finally becoming available in the local market. He revealed two reasons for insisting that PG&E's brokers obtain an excess plan:

1. With PG&E's present plan of insuring for only 70-percent, the amount which the utility absorbs for every loss is subject to treatment under Sect. 1231 (a 1958 amendment to the Internal Revenue Code), and therefore deductible for income tax purposes at the capital gains rate of only 25-percent.
2. The insurance companies “are getting tougher in the adjustment of claims for losses, and the best relief for this headache is to have fewer claims.”

Mr. Salm noted that the Insurance Committee of the Edison Electric Institute has been greatly concerned over the denial of recent claims by the insurance companies. Most of these denials are for losses involving electrical apparatus where questions involving interpretation of the electrical apparatus or inherent explosion clauses are raised by the adjusters.

“It appears quite likely that word has come down to the adjusters to question all such claims,” commented Mr. Salm. “If the insurance companies are to follow the practice of denying such claims, then it is foolish on our part to insure against such losses. With a fire insurance plan in excess of a large deductible, we would eliminate most of the claims and certainly the small one which the insurance companies may refuse to pay because they are reasonably sure we will not sue to collect.”

Mr. Salm reported that his company has recently conducted an extensive study of PG&E fire loss experience for a period of the last five years, taking into account the income tax effect on such losses, and arrived at a premium rate which the utility could afford to pay for fire insurance in excess of $100,000 each loss.

“With a deductible of $100,000, we will have few if any claims,” he indicated. “Therefore, our total losses should be deductible for income tax purposes at the full corporate rate of 52-percent.

“In September, 1959, we instructed our brokers to attempt once more to obtain coverage for us in excess of $100,000 each loss for the rate which our study had shown to be reasonable. Their progress has been slow but I am happy to report that I believe we will finally get it.”

CONTROLLED COOLING BOOSTS OUTDOOR FLUORESCENT LAMP OUTPUT

Controlling temperature of even one small spot on a fluorescent street-lighting lamp can improve light output and reduce overall costs.

By H. A. VAN DUSEN, JR.
Development Engineer
Line Material Industries

PELTIER thermoelectric cooling, a recently-announced development, can increase light output of fluorescent lamps used in outdoor fixtures very considerably under normal operating conditions. Luminaires equipped with such a cooling device cost less per lumen to operate, provide uniform light output independent of ambient temperature and weather conditions, and operate at higher efficiencies.

This is because fluorescent lamps are extremely temperature-sensitive within the range of normal operating conditions, a characteristic not shared by other conventional light sources such as mercury and incandescent lamps. Fig. 1 shows variation of light output with bulb-wall temperature.

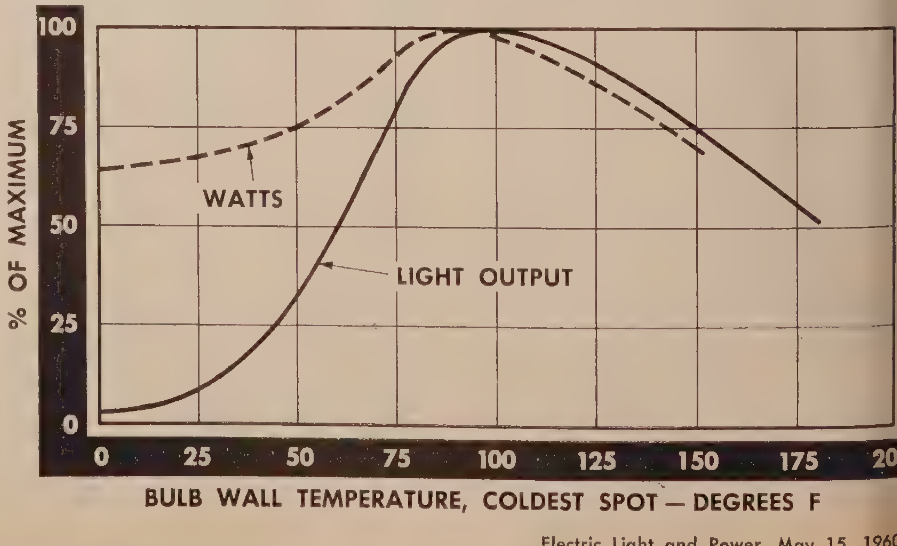
Temperature sensitivity of fluorescent lamps results from the direct relationship between bulb-wall temperature and internal mercury-vapor pressure. This internal pressure is very low—normally between 6 and 10 microns, or 1/100,000th of normal atmospheric pressure. Hence, even small changes in temperature will result in relatively large changes in vapor pressure.

Changes in vapor pressure affect light output of fluorescent lamps in two ways: 1. Lamp phosphors generate visible light efficiently only when excited by ultraviolet light of specific wave lengths. But mercury vapor generates these particular wave lengths only at optimum vapor pressure. 2. Voltage drop across the lamp and wattage consumed by the lamp vary with changes in mercury pressure. Wattage drops off considerably at vapor pressures higher or lower than the optimum value, causing a corresponding reduction in light output.

Temperature sensitivity presents no problem when fluorescent lamps are used indoors because ambient air temperatures are quite constant Furthermore, indoor luminaires are ventilated, keeping rise of lamp-bulb-wall temperatures above ambient to a minimum. Thus, indoor fluorescent lamps generally operate at rated wattage and product rated light output.

The situation outdoors is quite different. Here lamps must operate through an ambient-temperature range of 100F or more and temperature-sensitivity becomes a critica problem. In addition, air tempera-

Fig. 1—Typical light output and wattage variation vs. bulb wall temperature of fluorescent lamps



ure within outdoor luminaires often exceeds by 100 degrees the outside ambient temperature since hese fixtures are completely enclosed to prevent entrance of dust, water, bugs, smoke, and other foreign matter. Hence, because of this differential, uncorrected optimum bulb-wall temperature for maximum light output generally occurs when outside ambient temperature s below freezing.

Lamp Performance Vs. Temperatures

Extremes in temperatures found n operating outdoor fluorescent amps are quite different from those sed as standard for rating lamps. Photometric performance of an outdoor fluorescent luminaire is measured while the fixture operates as a omplete unit in still air at 77F. During these tests, lamps within the ixtures supply less than 60 percent f their maximum light output as hown by Fig. 2. As a result, photometric values for the luminaire are nuch less than optimum values that vould occur if lamp-bulb walls ould be kept at lower temperatures.

Luminaire manufacturers generally supply curves showing variation of light output versus ambient emperatures external to their luminaires. These curves, such as hown in Fig. 3, are similar to Fig. except that light output is labeled 00 percent at the value corresponding to the luminaire rating point 77F).

Streetlighting Application Difficulties

Temperature sensitivity of conventional fluorescent luminaires omplicates their application because temperature and wind conditions must be determined before a ghting installation can be designed ntelligently. An ambient temperature of 77F is commonly selected as e design criterion so that rated hotometric values of the luminaires can be used. However, seasonal variations resulting in lower verage temperatures would result over-design with average light utput of the luminaire much greater than the required values.

If lighting installations could be esigned around luminaires operating near optimum output, fewer luminaires would be needed, resulting in a considerable saving in cost

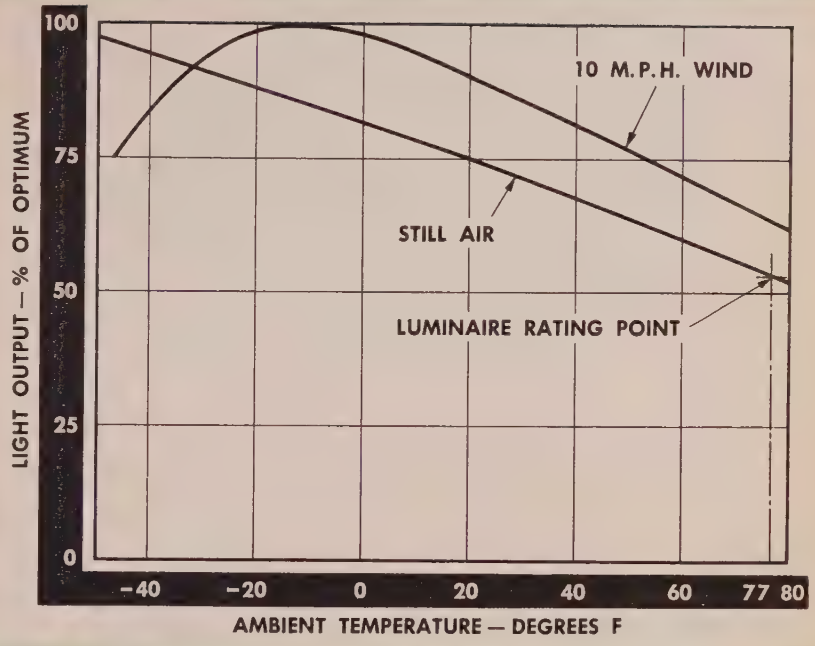


Fig. 2—Light output variation of conventional street lighting fluorescent luminaire.

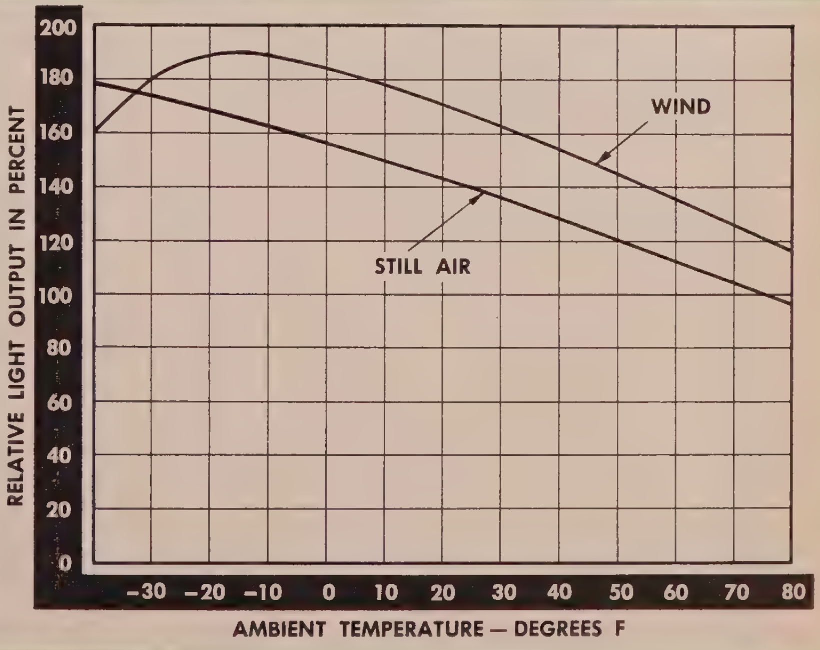


Fig. 3—Light output variation vs. ambient temperatures external to luminaires.

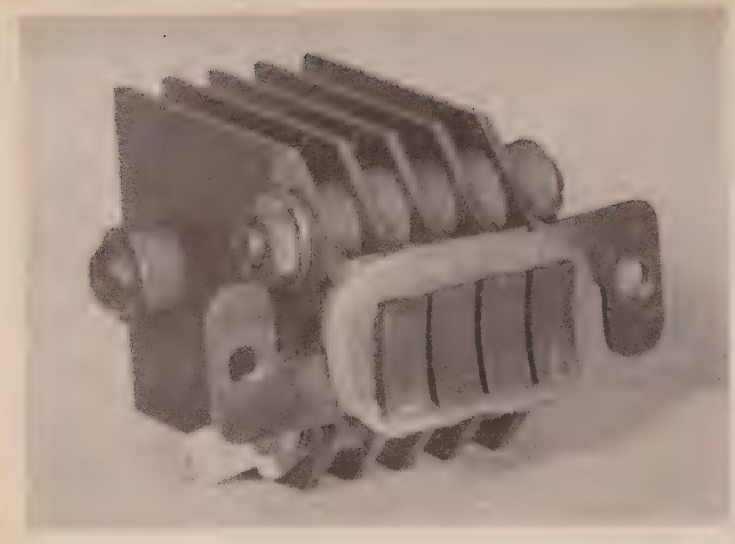


Fig. 4—Typical thermoelectric assembly.

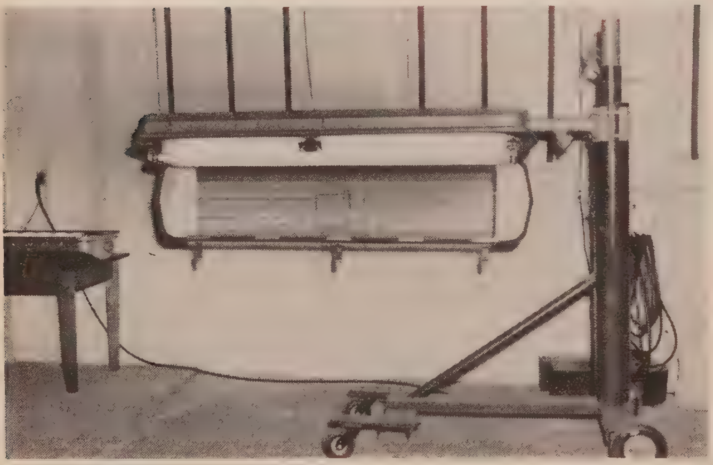


Fig. 5—Luminaire using thermoelectric cooler.

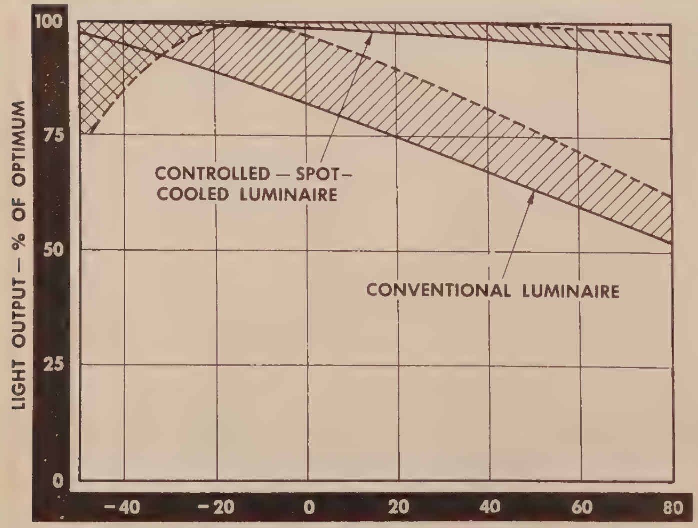


Fig. 6—Performance curves of luminaires with and without controlled spot cooling; solid edge of band represents still-air conditions; dotted line represents 10 mph of wind.

of installation. Hence, cooling of the lamp-bulb wall becomes important.

Spot Cooling Improves Output

Light output of a fluorescent luminaire can be improved and maintained near optimum by cooling lamps within luminaires. There are several methods of doing this:

1. *Circulate air within the luminaire with a fan.* This is the simplest and least expensive method. However, it provides only negligible gain in light output. Air within luminaires can become as hot as 150F when outside ambient temperatures are high. Blowing this hot air over the lamps cannot cool them to the 100F needed for good light output.

2. *Refrigerate air within the luminaire.* This requires a very large refrigeration capacity because power consumed by many luminaires approaches one kw.

3. *Refrigerate or cool a small spot on each of the lamps within the luminaire.* This has been found t be the most effective and practical approach. The entire lamp-bulb wall need not be maintained at its optimum temperature. Maintaining a small spot at optimum temperature allows the internal mercury vapor to condense at this spot and to establish an equilibrium pressure that corresponds to temperature o this spot.

It has been found that a cool spo less than 0.15 percent of the lamp surface satisfactorily controls ligh output. Only a small amount of refrigeration or cooling capacity is required because of size of the spot Generally less than six watts of hea removal per lamp is satisfactory.

The cooling spot can be at almos any point on the bulb wall. If th cooling device is controlled to maintain a constant cold-spot temperature, light output will be approximately constant and near it optimum value. Even with wid variations in ambient temperature and even though average bulb-wal temperatures may reach high values, there will be practically no effect on lamp characteristics so lon as the spot continues to be refrigerated properly.

Spot cooling can be accomplishe by using air jets, liquid system Peltier thermoelectric devices, an other methods. A luminaire wit the thermoelectric device has bee developed and found to operate most successfully.

Details Of Thermoelectric Spot Cooler

Fig. 4 illustrates a typical thermoelectric assembly; this unit was developed and is manufactured by the Minnesota Mining and Manufacturing Company. In operation, direct current flows through junctions of dissimilar metals absorbing heat in one junction and liberating it in the other. Semi-conductors are used as the junction material. The cold junctions contact approximately one-half square inch area of the lamp-bulb wall. Hot junctions are attached to cooling fins which dissipate heat developed by resistance of the junction plus heat pumped from the lamp.

A small fan is incorporated within the luminaire to provide air circulation around the cooling system and also to assist in cooling the lamp ballast. Without the fan, the ballast would operate hotter than in a conventional luminaire because the lamps consume full rated wattage when producing optimum light output.

The thermoelectric device is powered with low-voltage direct current obtained from a power supply similar in size and appearance to a lamp ballast. Cold-junction temperature is sensed by a control circuit that varies d-c power supply to the device, thereby maintaining proper operating temperature.

Auxiliary power required for the thermoelectric device in a fluorescent luminaire having 600 watts on lamp capacity is approximately 50 watts, including power-supply losses. A luminaire using thermoelectric coolers is shown in Fig. 5. Performance curves for luminaires with and without controlled spot cooling are shown in Fig. 6. Both fixtures utilize four 1½-ampere lamps. Considerable improvement in light output through use of the spot cooler is obvious.

Economics Of Spot-Cooled Units

Luminaires incorporating controlled spot cooling cost less than conventional luminaires when compared on a cost-per-lumen basis, although cost per luminaire is higher. Peak power requirements increase slightly due to auxiliary power supply. This increase is negligible in cool ambient temperatures and approaches 10 percent when operating at the highest ambient. However, at high ambient temperatures increase in light output is considerably greater than increase in power consumption.

There will be a very significant reduction in initial cost of spot-cooled unit installations because fewer luminaires are required for a specific lighting job. And, of course, fewer luminaires mean less maintenance.

Two criteria can be used to determine reduction in the number of luminaires that might be expected in a typical lighting installation:

1. In the past, many lighting installations have been designed for median or average ambient conditions; median ambient temperature in the United States is approximately 50F and average wind velocity is about 10 mph. However, median temperature rarely occurs since on most days it is either much above or below median. Extremes are very pronounced, especially in many northern cities, reaching 90F or more during the summer and 0F or below in winter.

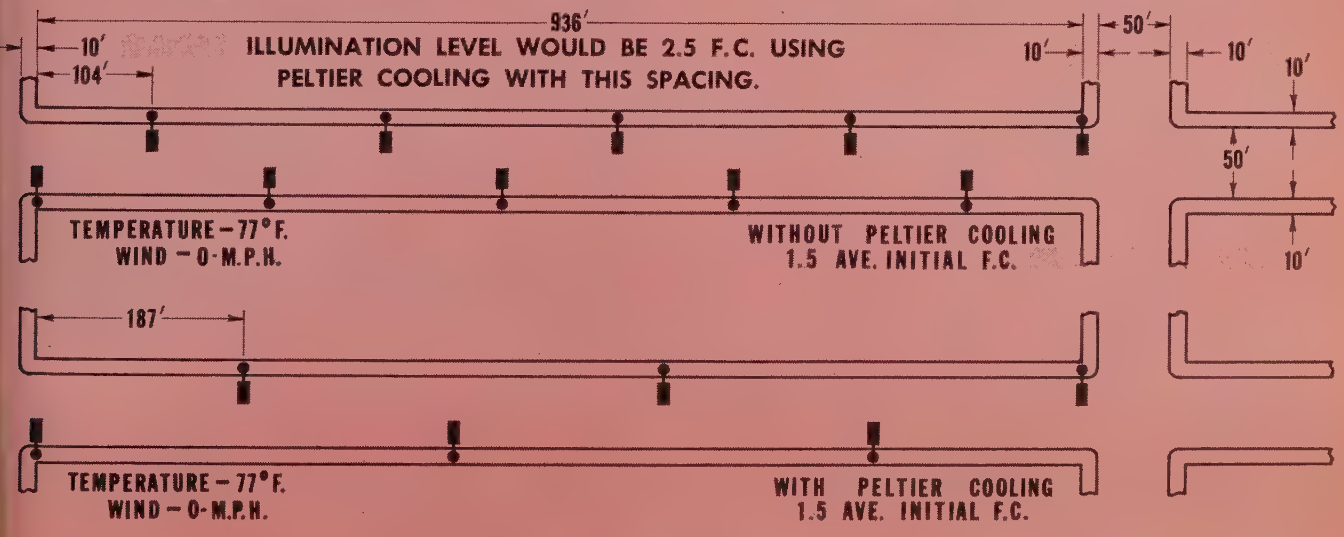
2. It is more realistic to design lighting installations to provide a minimum maintained level of illumination throughout a wide band of ambient temperatures. For example, the cold ambient might be —20F at 10 mph of wind and the high ambient 77F at 0 mph. When using such criteria, the luminaire described in Fig. 6 would have a useful light output approximately 70 percent higher than a conventional luminaire. Therefore, the total number of luminaires could be reduced as shown in Fig. 7.

In general, the application of a controlled spot-cooled luminaire is considerably simplified as compared to conventional fluorescent luminaires because the light output is essentially independent of ambient temperature and weather conditions.

Future Developments

Spot cooling presents the possibility of designing more lamps specifically adapted to this process. Such developments are expected in the near future, and these will provide additional gains in light output.

Fig. 7—Spot cooling serves to raise illumination level when spacing stays the same, or, permits considerably wider spacing while providing the same amount of illumination.



Now Computer Spots Transmission Towers

Arizona Public Service Co. engineers V. Converti, E. J. Hyland, and D. E. Tickle showed a recent engineering operating section of Pacific Coast Electrical Association that savings of over $1000 per mile can be obtained by optimizing the spotting of transmission towers on the digital computer. Their computer program also reduces engineering costs by five to one due to the computer's ability to duplicate tower spotting calculated by conventional hand methods at a 30-seconds-per-mile rate.

Other benefits: direct input from aerial survey route mapping which, furnished along with actual profile, provides a punched card record of the terrain coordinates (permits automatic processing of survey notes); alternate route tower spotting when several routes are to be investigated with economic comparison of alternatives; complete computation and tabulated record of tower height, tower span, added weights, tower costs, horizontal and vertical span loading, total cost and cost per foot.

The computer simulates the usual spotting template by using an arbitrary origin of a cartesian co-ordinate system such as sea-level and station zero. The curve's equation is then formed and varied as required to move the axis of symmetry of the curve right or left from a given tower to determine the proper position which provides adequate ground clearance throughout the distance spanned. There is a corresponding vertical displacement of the curve with each shift to right or left. When the curve is properly positioned for required ground clearance, the equation is varied again to consider different tower heights which may exist at each position.

Computer output is sufficient to enable an engineer to complete all of his charts regarding location of transmission towers and, when coupled with location survey, order all materials necessary to build the structures. In addition, sufficient information is contained to cross-check any of the loading conditions.

NCUR Moves On FCC Petition Action

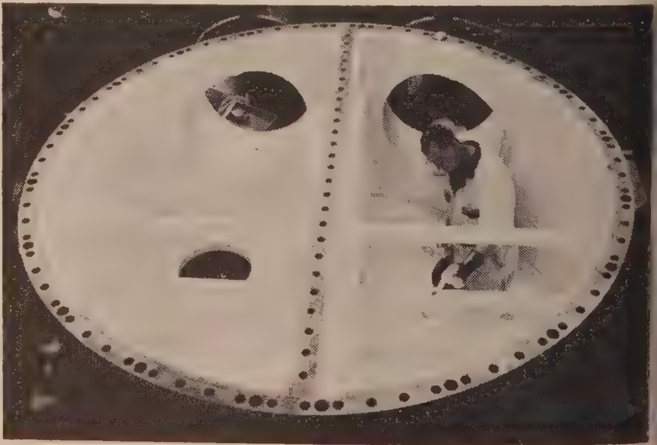
The Executive Council of the National Committee for Utilities Radio (NCUR) has approved action of NCUR officers in filing a petition with FCC on February 29, 1960, requesting additional high band (152-162 mc) frequencies for Power Radio Service licensees in the six states which were denied use of the new channels formed in the power radio block of frequencies when the band width was reduced from 60 kc to 30 kc. Involved are Washington, Oregon, Texas, Louisiana, Arkansas, and Oklahoma. *(For some of the most recent advances in Mobile Radio, see page 106.)*

Highway Lighting Still Too Low

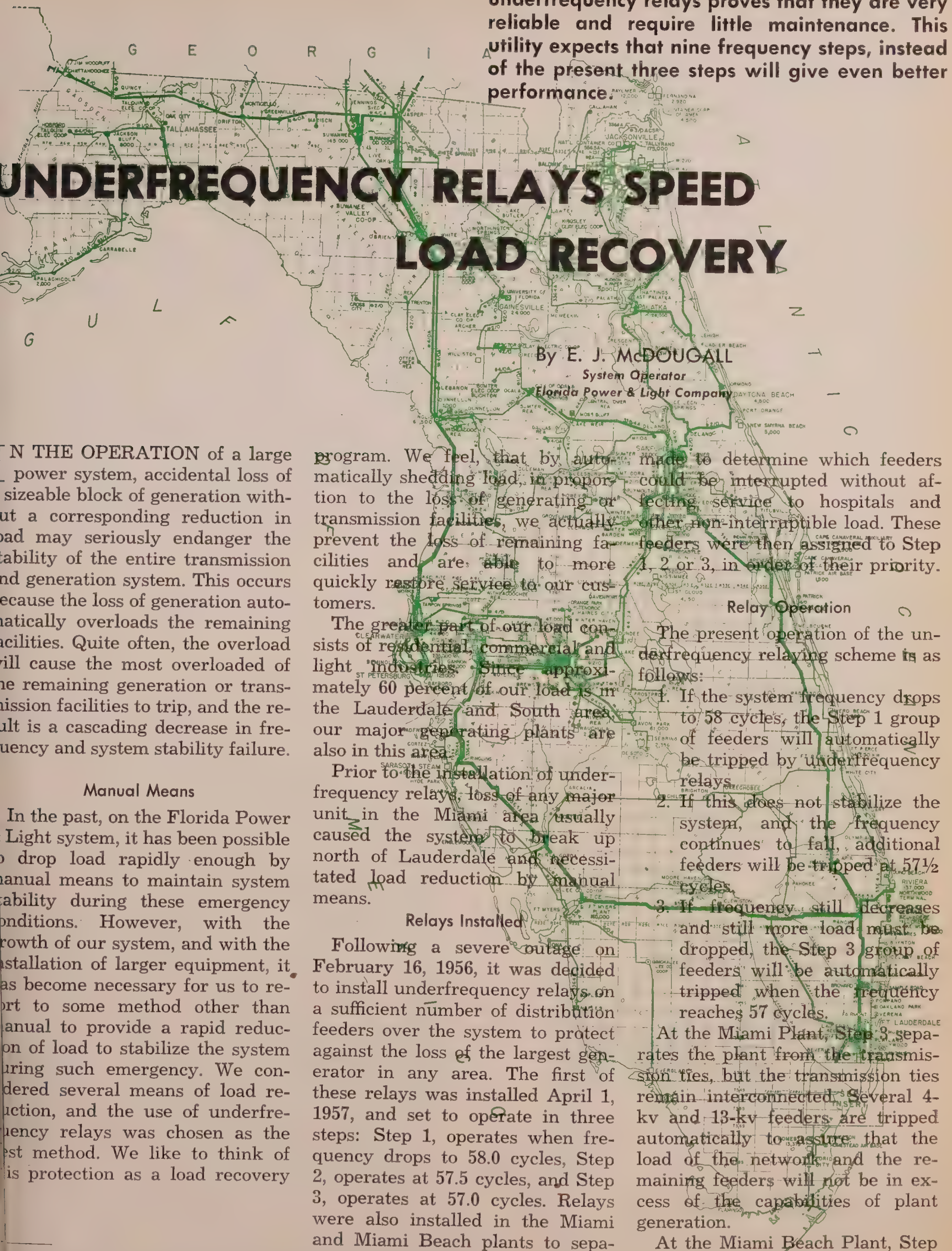
Recommended practice in highway lighting may be 50 percent below the level needed for safely stopping a vehicle moving at 40 or 45 mph, said Dr. H. Richard Blackwell, of Ohio State University, at a recent Illuminating Engineering Research Institute research symposium. Recommended practice is 0.2 to 1.2 footcandles. Dr. Blackwell's measurements, using a new version of his evaluator, which is generally recognized as one of the most dependable instruments in illuminating engineering, show a need for 0.7 to 2.8 footcandles.

Additionally, the curb lane—the lane which pedestrians enter when stepping from the sidewalk—requires about twice as much light for relative safety as the center or driving lanes, he said.

Benjamin S. Pritchard, also of Ohio State University, in his paper reported new findings on sight through fog on turnpikes. Three-hundred-watt spotlights, mounted on 28-ft poles so that their beams are directed away from the driver's line of sight at an angle of about 40 degrees from the perpendicular, can produce safe visibility up to 136 ft in a fog which, in daytime, would reduce visibility to a scant 60 ft.



Plastic coatings are being tried to prolong condenser water box lif on Ohio Power's new 450-mw Unit 5 at Philip Sporn Plant on th Ohio River in West Virginia. Here, an experimental 1/16 in. epoxy-resi coating is being brushed on the interior of a fabricated steel wate box for Unit 5's 18,000-sq-ft surface condenser. The welded-tub condenser will serve a boiler feed pump turbine at the plant. Othe water boxes for Allis-Chalmers condensers are being similarly treate for corrosion protection.



UNDERFREQUENCY RELAYS SPEED LOAD RECOVERY

Florida Power & Light Company experience with underfrequency relays proves that they are very reliable and require little maintenance. This utility expects that nine frequency steps, instead of the present three steps will give even better performance.

By E. J. McDOUGALL
System Operator
Florida Power & Light Company

N THE OPERATION of a large power system, accidental loss of sizeable block of generation withut a corresponding reduction in oad may seriously endanger the tability of the entire transmission nd generation system. This occurs ecause the loss of generation autonatically overloads the remaining acilities. Quite often, the overload vill cause the most overloaded of he remaining generation or transnission facilities to trip, and the reult is a cascading decrease in freuency and system stability failure.

Manual Means

In the past, on the Florida Power Light system, it has been possible o drop load rapidly enough by nanual means to maintain system tability during these emergency onditions. However, with the rowth of our system, and with the stallation of larger equipment, it as become necessary for us to reort to some method other than anual to provide a rapid reducon of load to stabilize the system uring such emergency. We condered several means of load reuction, and the use of underfreuency relays was chosen as the st method. We like to think of is protection as a load recovery program. We feel, that by automatically shedding load, in proportion to the loss of generating or transmission facilities, we actually prevent the loss of remaining facilities and are able to more quickly restore service to our customers.

The greater part of our load consists of residential, commercial and light industries. Since approximately 60 percent of our load is in the Lauderdale and South area, our major generating plants are also in this area.

Prior to the installation of underfrequency relays, loss of any major unit in the Miami area usually caused the system to break up north of Lauderdale and necessitated load reduction by manual means.

Relays Installed

Following a severe outage on February 16, 1956, it was decided to install underfrequency relays on a sufficient number of distribution feeders over the system to protect against the loss of the largest generator in any area. The first of these relays was installed April 1, 1957, and set to operate in three steps: Step 1, operates when frequency drops to 58.0 cycles, Step 2, operates at 57.5 cycles, and Step 3, operates at 57.0 cycles. Relays were also installed in the Miami and Miami Beach plants to separate these stations from the system at 56 cycles. A review of the loading of all distribution feeders was made to determine which feeders could be interrupted without affecting service to hospitals and other non-interruptible load. These feeders were then assigned to Step 1, 2 or 3, in order of their priority.

Relay Operation

The present operation of the underfrequency relaying scheme is as follows:

1. If the system frequency drops to 58 cycles, the Step 1 group of feeders will automatically be tripped by underfrequency relays.
2. If this does not stabilize the system, and the frequency continues to fall, additional feeders will be tripped at 57½ cycles.
3. If frequency still decreases and still more load must be dropped, the Step 3 group of feeders will be automatically tripped when the frequency reaches 57 cycles.

At the Miami Plant, Step 3 separates the plant from the transmission ties, but the transmission ties remain interconnected. Several 4-kv and 13-kv feeders are tripped automatically to assure that the load of the network and the remaining feeders will not be in excess of the capabilities of plant generation.

At the Miami Beach Plant, Step 3 separates Unit No. 4 and the 13-kv feeders from the transmission system. The transmission lines are

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Editor's Note—This is the essential text of a per presented by the author before the Eneering and Operation Section Meeting of Southeastern Electric Exchange held in anta, Ga., in October 1959.

left tied through and the 4-kv feeders are dependent on the transmission supply.

Underfrequency Panel

A separate control panel is provided in the two plants and at each substation for the underfrequency relays. A standard installation consists of a panel having one or more underfrequency relays (provisions are made for installing three such relays), a white light for potential indication, three lockout relay reset switches (one for each underfrequency relay position), one blue indicating light for each lockout relay (mounted directly above its associated lockout relay reset switch), and five feeder frequency selector switches. For the large substations, a panel similar in all respects is used, except that it provides for up to ten feeders.

Each underfrequency relay is tuned to operate at only one frequency (58, 57½ or 57 cycles). The white light on the front of the panel indicates that the potential source for the underfrequency relays is energized. This light normally burns at all times. The reset handle for each lockout relay is marked to indicate the underfrequency relay which causes that particular lockout relay to trip. The blue light above the lockout relay reset handle indicates that the trip coil of that particular lockout relay is good and that the 125-v dc supply to that lockout relay is energized. This light should burn at all times, except when that particular lockout relay has tripped.

When the lockout relay is tripped by its associated underfrequency relay, the lockout relay reset handle moves to the OFF position. This handle must be reset manually before the affected feeder breakers can be closed. Each feeder has a frequency selector switch. This permits changing frequency assignment of that feeder at any time; by turning this switch to the OFF position, that particular feeder will not be tripped by underfrequency.

The operation of an underfrequency relay causes its associated lockout relay to trip. The lockout relay simultaneously trips and locks open all feeder breakers assigned to it, and also causes the lockout relay reset handle to move to the OFF position. The blue light associated with that lockout relay is also deenergized.

Switchmen Dispatched

Following the occurrence of an underfrequency relay operation, switchmen are dispatched to the substations affected. Upon arrival at the substation, the switchman will:

1. Turn to the OPEN position the control switch handle of each circuit breaker which has tripped due to underfrequency, and then report to the dispatcher for further instructions. Advise the dispatcher of all underfrequency relay targets, lockout relay targets, and feeders which were tripped by underfrequency operation.
2. Reset lockout relay switch handles on the underfrequency relay panel.
3. Reclose the affected circuit breakers, as authorized by the dispatcher.
4. Report times of closing, counter numbers, etc., to the dispatcher.

Following is a brief description of two cases of trouble of somewhat similar nature, one occurring before and the other after installation of underfrequency relays.

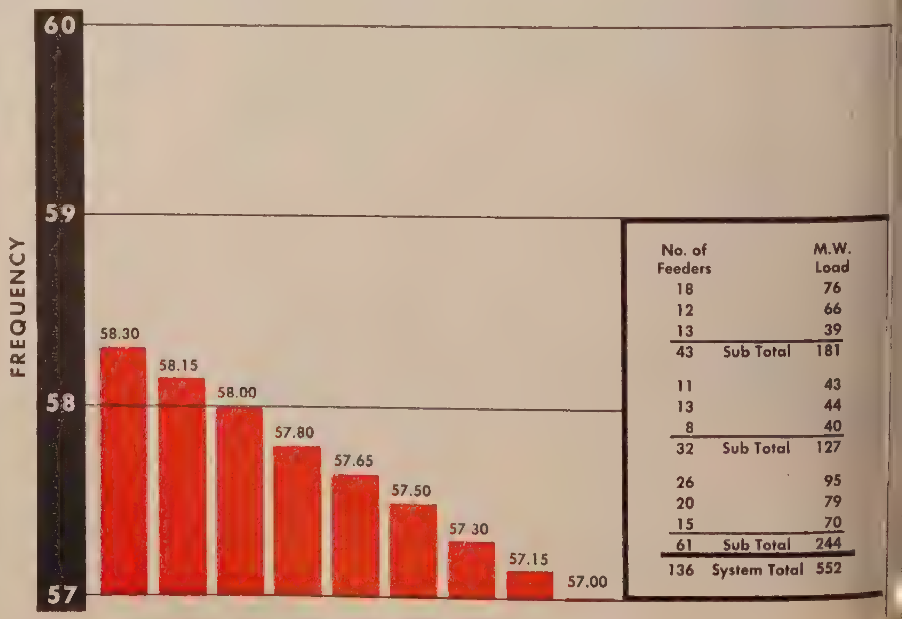
Before Relays Installed

On February 16, 1956, at 5:51 pm, the loss of the two 138-kv circuits between Cutler Plant and Dade Substation, and the overloading and relaying of the three 69-kv circuits served from the Cutler Plant, isolated Cutler from the system. At this time, the system load amounted to 660 mw, of which Cutler Plant was carrying 283 mw. The loss of the Cutler generation overloaded transmission and generating facilities in the Miami and Lauderdale areas, resulting in the loss of the Miami and the Miami Beach plants.

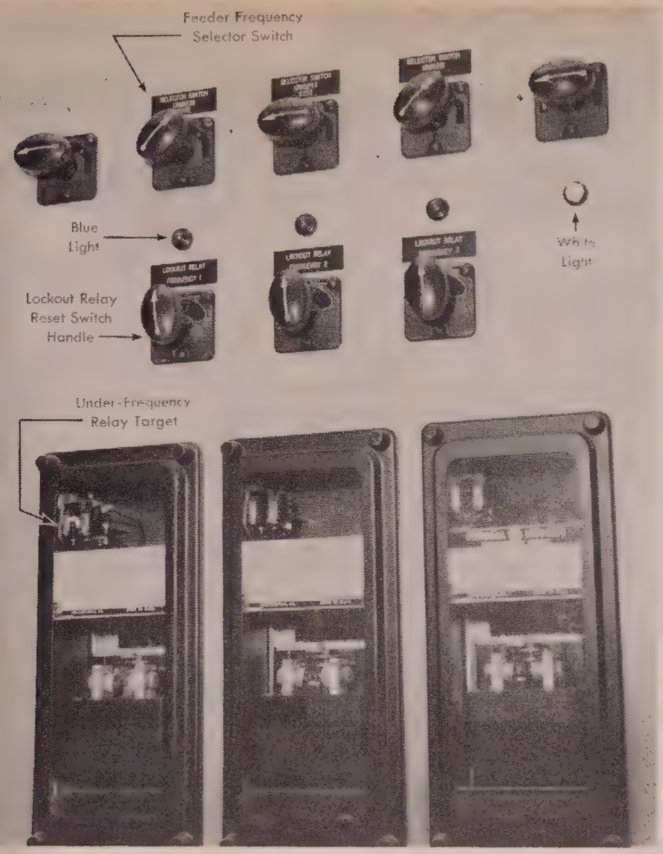
In the first case, the loss of this generating capacity resulted initially in the interruption of service to approximately 50 percent of the total system load, to approximately 80 percent of the Miami area load, and to approximately 60 percent of the Southeastern Division load. Service to approximately 35 percent of the system load was interrupted for 40 min, service to approximately 20 percent of the system load was interrupted for an additional 40 min. Service was restored to all loads approximately 2½ hr. after the initial interruption.

During this period, there were interruptions of service of greater than 1 min duration to 44 of the 99 substations of the system, as fol-

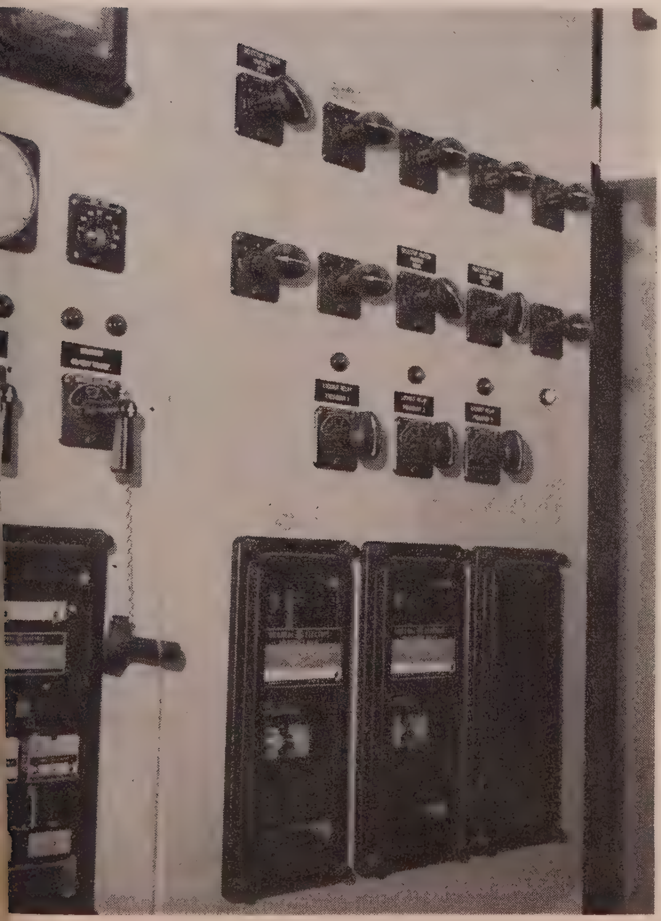
Frequency assignment chart showing assignment of underfrequency relays by frequency feeder and load.



No. of Feeders		M.W. Load
18		76
12		66
13		39
43	Sub Total	181
11		43
13		44
8		40
32	Sub Total	127
26		95
20		79
15		70
61	Sub Total	244
136	System Total	552


Feeder Frequency Selector Switch
Blue Light
White Light
Lockout Relay Reset Switch Handle
Under-Frequency Relay Target

Above: Standard underfrequency panel for five or less feeders. Below: Standard underfrequency panel for ten or less feeders.



lows: 20 of the 27 substations in the Miami area, 6 of the 9 substations in the Southeastern Division, 12 of the 19 substations in the Eastern Division, 4 of the 10 substations in the North Central Division, and 2 of the 14 substations in the Western Division. These interruptions made newspaper headlines over the state and caused much criticism from our customers.

After Relays Installed

The second of these two cases of trouble occurred on November 12, 1957, after partial installation of underfrequency relays had been completed. At 12:23 pm, a lightning arrester failure on C-phase of the West 138-kv bus at Dade Substation caused a differential relay action which cleared the West bus. At 12:24 pm, another differential relay action cleared the East bus. This, in effect, resulted in the loss of the 138-kv lines between Cutler and Dade. The system load was approximately 720 mw, with the generation as follows: Cutler 323 mw, Miami 43 mw, Miami Beach 24 mw, Lauderdale 57 mw, Riviera 120 mw, Sarasota 37 mw, Sanford 10 mw and Palatka 106 mw. The three 69-kv circuits served from Cutler have a total capacity of 180 mw. It was necessary to reduce Cutler's generation by 143 mw to prevent overloading the 69-kv lines.

The loss of generation at Cutler resulted in a system break-up, with the system dividing into three areas: Area 1, the Cutler, Miami and Miami Beach area; Area 2, the Lauderdale, Riviera area; and Area 3, Sarasota, Palatka and Sanford area. Areas 2 and 3 were not affected by underfrequency relay action, since the frequency was above the trip settings. In Area 1, however, the frequency dropped to 56.2 cycles and underfrequency relays operated to reduce load approximately 65 mw. The manual dropping of ten feeders at the Miami and Miami Beach plants resulted in an additional reduction of load in the amount of 40 mw. In this instance, the reduction of load by underfrequency relays, followed by the load dropped manually, prevented a system break-up as experienced on February 16. There was no newspaper publicity and very little criticism from our customers following this interruption.

In Case No. 1, service interruptions lasted as much as 2½ hr, while in Case No. 2, most service was restored in less than 30 min. Some interruptions continued for an hour but only because of the time required to clear the defective lightning arrester. All underfrequency relays operated correctly and prevented an area shutdown. However, relays at the Miami and Miami Beach plants, set to separate the plants from the system at 56 cycles, did not operate, as the frequency dropped to only 56.3 cycles. Plant auxiliary equipment, however, was adversely affected by low frequency and voltage, and it was decided to change the settings to 57 cycles.

Resetting Relays

Since underfrequency relays were installed, we have had seven cases of equipment failures causing break-ups in certain parts of the system, resulting in underfrequency relay operation. Relay operations have been correct, but in some cases, more load was dropped than would have been necessary due to sharp decline in frequency, resulting in a dip into the next lower setting and the large amount of load assigned to each frequency step. We are now in the process of resetting certain relays in each of the basically assigned steps so that each of the steps would be spread into a wider band.

Nine Frequencies Better

A study of the various underfrequency conditions was made and the results obtained disclosed that it would be possible to set the underfrequency relays in such a manner that the load dropped would more closely approximate the loss of generation or transmission facilities. Since the frequencies of 58, 57.5 and 57 cycles now used, resulted in dropping extremely large blocks of load, it was decided to actually use nine frequencies instead of three.

For instance, 58 cycles would be a nominal setting, and the relays which had all formerly been set at 58 cycles would be set at either 58.30, 58.15 or 58.0 cycles. Relays in the 57.5 cycle step would be set for 57.8, 57.65 or 57.5. The relays in the 57.0 cycle step would be set for 57.3, 57.15 or 57.0 cycles. Precise calibration of the relays requires a minor modification of the existing relays to obtain the desired frequency settings. This modification consists of substituting a screwdriver adjustable potentiometer for a slidewire type resistor in the tuned circuit of the underfrequency relay.

Closer Ratio

When changes in relay settings over the system have been completed, we feel that a much closer ratio between loss of generation and load dropped will be obtained.

All new feeder breaker installations are now wired for underfrequency relays, although relays may not be installed until later. We now have 136 feeders with a total load of 552 mw that may be tripped by underfrequency relays.

Experience with underfrequency relays for load reduction in the manner described has proven to be both practical and satisfactory. However, operating experience has disclosed a number of interesting points which are worth mentioning.

Nine Points

1. Relays should be connected to a potential source which is located on the same bus as the breakers that are to be tripped if correct operation is to be assured.
2. Much of the load to be dropped is at tapped substations, and it was in several of these substations that the first installations were made. The first time that the transmission line on which these substations were located tripped, the underfrequency relays also operated, causing unnecessary outages. Examination disclosed that the six-cycle time delay of the underfrequency relays was not sufficient to override the decay of voltage and frequency which existed on the line after the line terminals opened. Oscillograms were taken on the lines judged to have the slowest rate of voltage decay, and it was determined that 0.35 sec would be an adequate time delay in most cases. Adjustments were made to provide this additional time delay which eliminated these undesirable actions.
3. If heavy industrial load is added to a transmission line and there are stations on this line which contain underfrequency relays, voltage decay after a line operation should be rechecked.
4. Use of underfrequency relays to separate power plants which furnish heavy essential load at generated voltage requires extremely careful examination of the application.
5. Periodic review of feeder assignment is necessary in order to meet changing operating conditions.
6. To aid in rapid restoration of service following underfrequency relay actions, accurate records of feeder and frequency assignments are kept by dispatchers. This allows prompt dispatching of switchmen to affected substations without waiting for trouble calls to disclose the pattern of interruptions.
7. Standardization of equipment is helpful in personnel training for both maintenance and operation.
8. Adequate and continuous training of all personnel in load restoration is essential.
9. An occasional misoperation (operation or failure of operation of an underfrequency relay) may result from other reasons, such as personnel errors and omissions and mechanical or electrical failures. If the principal reason for having underfrequency relays is kept in mind, the misoperation usually is not considered too serious.

Conclusion

In conclusion, we can say that experience gained during the period we have used underfrequency relays has proven their operation to be very reliable and little maintenance is required. They have served their purpose well and we hope that the use of nine frequency steps, instead of the original three, will give us even more satisfactory performance.

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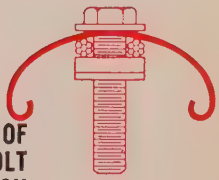
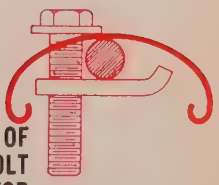


POSITION OF
LOWER BOLT
CONNECTOR ON
STRAND LOOP.



POSITION OF
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LIVER ELECTRICAL MANUFACTURING CO., Battle Creek, Mich.

'PHONE CALL STARTS BRITAIN'S FIRST AUTOMATIC PEAKING STATION

Featuring a diesel-fueled turbine conversion as prime mover, remote controlled "pocket" station has advantages of low capital cost, fully automatic operation, instant readiness, high reliability, and low maintenance.

By J. GRINDROD
Milton, Hants., England

SAID TO BE the first of its kind and size in the world, Britain's new 3000-kw remote-controlled "pocket" power station at Princetown, Devon, was started recently by dialing a telephone number in the headquarters control center of the South Western Electricity Board at Bristol, 100 miles away. The station will provide peaking and emergency power on a fully-automatic basis, with routine inspections only four times a year and an overhaul about once every ten years.

Prime mover is a modified version of a well-known aircraft and marine gas turbine, the Bristol Siddeley Proteus, which has been adapted to operate on diesel oil. It weighs little more than a ton and requires no cooling water or warming up. Because of its small size and low mass, full load is expected in less than two and one-half minutes from a cold start.

The reverse-flow gas system of the Proteus provides a simple, short, compact "free-turbine" two-shaft unit, without heat exchanger, which attains a high thermal efficiency through use of advanced compressor and turbine designs and a compression ratio of 7.3 to 1. Compressor and power turbines are mounted on concentric but mechanically independent shafts which enables each system to run at its optimum speed under all conditions. Other advantages are: 1. Power required for starting is relatively low because only the compressor system is rotated by the starter; 2. The generator is coupled to a unit of low inertia which facilitates automatic synchronization; and 3. The engine can meet an overload by putting out a higher torque at reduced speed without loss of power or risk of stalling.

Air enters radially through passages in a light alloy casing just to the rear of the mid-length of the engine and travels forward through 12 axial compressor stages to a simple centrifugal stage, where it flows outwards. On leaving the compressor, air is turned rearward into eight tubular combustion chambers arranged around the compressor casing. Here, fuel is injected and burned.

Hot gases expelled from the combustion chambers discharge through four turbines coupled in pairs. The first pair drives the compressor; the second pair drives the output shaft through a compound epicyclic reduction gear at the front end of the engine. This reduction gear is similar to that used on the Proteus aero-engine which has been tested at much higher powers than are developed by the turbo-generator engines, and which have proved very reliable in service.

Exhaust silencers and intake baffles reduce the noise level. Since the engine requires no cooling water, a generator with direct air cooling was selected for use with it. Of the protected type, it has two pedestal bearings and direct-coupled exciters mounted on a common bedplate conforming to BS 2613, 1957, or its equivalent in other countries.

Controls

The control system is designed to hold the fuel flow and power constant at ambient temperatures below 30 F. Above this temperature the set runs at a constant compressor speed, giving a maximum output which varies with air temperature. Maximum power is thus available in cold weather when it is most likely to be needed.

For peak load generation, there is no need to run at less than indicated powers in order to obtain reliable or economical operation, as is often the case with piston engines, and no provision is made to do so. In the event of an overload, the ability of the "free turbine" engine to put out a higher torque at lower speed provides a useful measure of automatic load shedding.

Starting and Synchronizing

A 110-volt battery provides current for the starter, for auxiliaries that have to run before the engine is started, and for energizing the solenoid for contact breaker closing. Should the engine fail to fire, precautions are taken to clear the combustion chamber of unburned fuel to avoid risk of a wet start at the second attempt.

Once the engine has started, the control motor opens the throttle until bus frequency is reached, when the generator is automatically put on the line and the engine goes at full throttle. If there is no system supply to serve as a standard for the control motor, it will provide a frequency of 52 cycles under no load, falling to 50 cycles at full load.

There are protective devices to prevent overspeeding under any circumstances and to stop the engine in case of pressure failure in either oil or fuel systems. Fire detectors are provided which shut down the engine and discharge carbon dioxide extinguishers in case of fire.

Supervisory Control

The Mark II "Datofonic" supervisory control equipment operates over the national telephone network, enabling the control engineer to carry out a total of up to 40 control functions such as start, stop, throttle control, etc. These facilities are supplemented by 22 pairs of indicator lamps of which the turbo generator utilizes 20. Telemeter display facilities are also provided for such quantities as megawatts, amperes, volts and other measurements from which the control engineer can determine power factor.

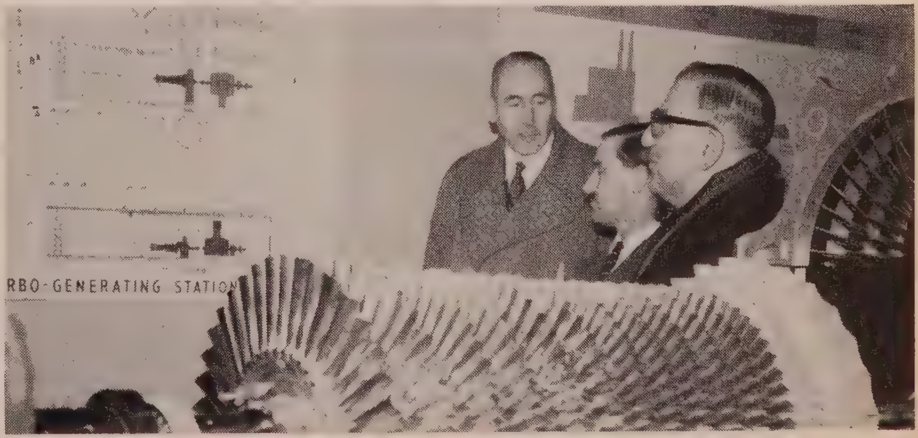
The control cabinet containing all of the remote plant's control facilities is capable of simple extension to permit control of as many as 24 additional substations. Since the equipment operates over the telephone network, the control engineer at Bristol can establish contact with the plant by using normal trunk call facilities. After obtaining necessary information and performing required control operation, he has the facility whereby he may instruct the remote equipment to disconnect itself from the telephone line.

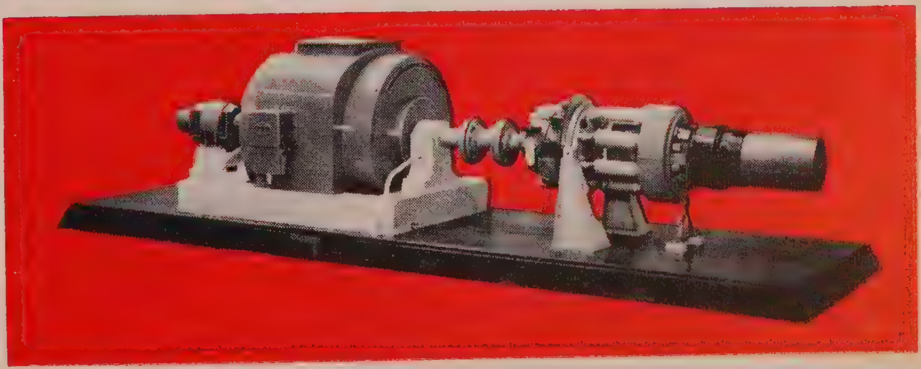
In the event of a change of state in the running condition of the set, equipment installed in the station automatically engages its own exchange line and verbally requests the operator to connect it with the Bristol control room. When the call is put through, the on-duty engineer hears the equipment announce its identity by voice, after which all control and telemetering facilities are available to him.

The Plant

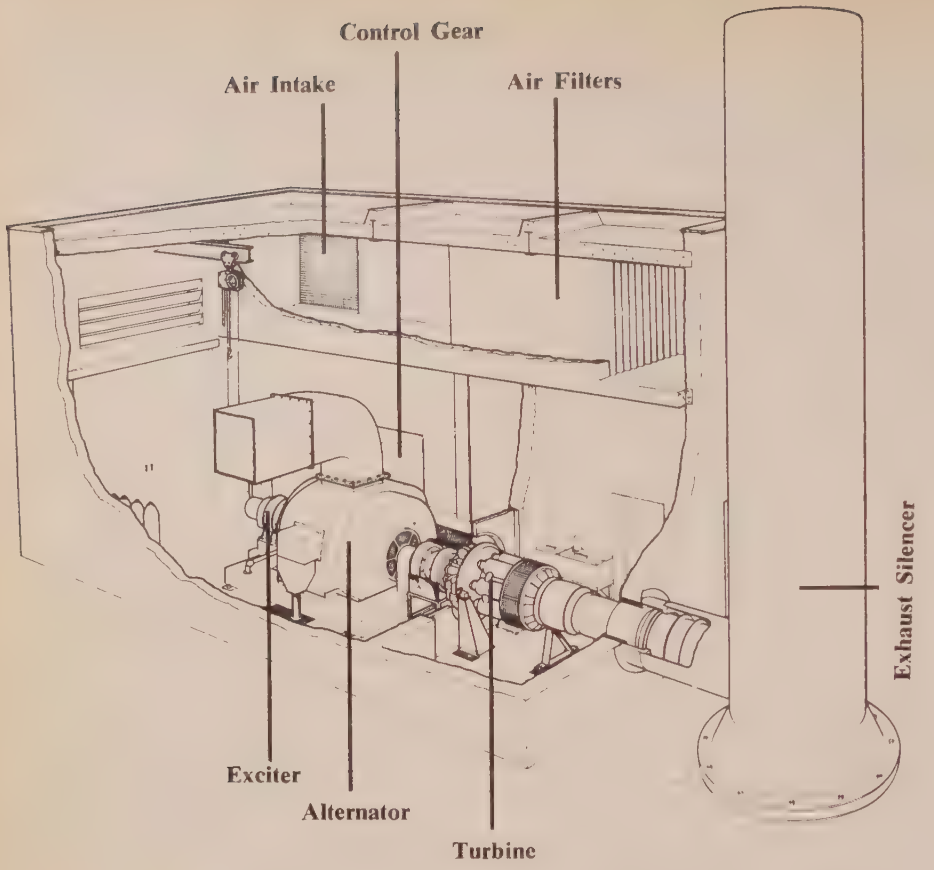
Compared with a conventional diesel, the Bristol Siddeley is ex-

Officials and guests attending inauguration ceremonies inspect components of a turbo generator installation at the Bristol-Siddeley plant similar to the Princetown station installation.



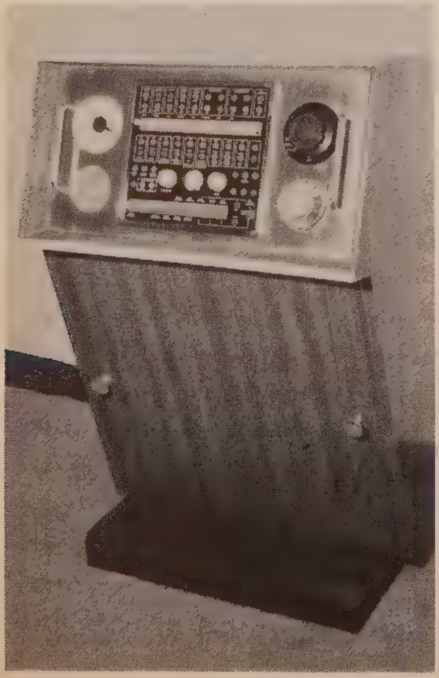


Quarter-scale model of Princetown installation showing simplicity of mounting requirements for the modified version of the turboprop aero engine which serves as prime mover.



General arrangement of major components in Britain's new Princetown 3000-kw "pocket" Power plant.

By using the telephone dial on the Datofonic control panel, the unmanned station 100 miles away can be started, interrogated as to running conditions, and also stopped.



tremely small. Because of its low weight and complete freedom from vibration, the only major foundations needed were those for the generator. These, however, in no way compare with what is required for a reciprocating engine. Thus, not only is the station relatively small but its foundations are simple and light.

No space heating of the building is required either for the generator or engine; heaters are built into the generator to ensure that the windings stay dry and warm at all times. Elimination of space heating, however, made it necessary to provide shutters with automatic operation on the engine air intake or generator ventilating air inlets.

Maintenance

Very little maintenance is required for this type of industrial turbine. After every 100 hours of operation the filters should be inspected, and the plant run and instrument readings logged. This should also be done if the plant has been idle for any extended period. Initially, the engine will be removed for inspection after 1000 hours of running, but it is expected that this period will be later increased to 2000 hours or more.

Advantages

This turbo-generator represents a significant departure from conventional methods and gives advantages of low capital cost, fully automatic operation with remote control for starting and shutting down, instant readiness at all times, high reliability, and low maintenance costs. Also, the installation is compact and self contained.

Although running cost per hour of the Proteus engine is rather high due to the relatively high thermal efficiency, this is of small consequence when running under peak-lopping conditions. Considering all factors, cost per kilowatt of output is about one third to one half that of conventional plant output, less if transmission and distribution costs are considered.

Conception of several such unattended power stations at strategic terminal points of a supply network is of interest as being complementary to large, highly-efficient plants located conveniently with regard to fuel availability. There may also be a case for running the generator as a synchronous condenser to compensate for the reactive component in long transmission lines.

COMPACT... ADAPTABLE... RELIABLE

New Westinghouse Isolated Phase Bus

Ever-increasing current and voltage ratings . . . maximum in compact arrangement . . . full adaptability to generating and distribution station layouts . . . complete reliability—these are the modern station demands met by new Westinghouse isolated phase bus. Here are the design features which assure long, trouble-free performance:

Single Insulator. Only one high-strength insulator is used at each bus support location. Deep grooves provide high dew withstand voltage. Resilient mounting reduces short circuit forces on the porcelain. All combine to provide maximum reliability of service.

Main Conductor. Hollow square or tubular bus may be specified to suit application requirements.

Enclosure Construction. Enclosures are cylindrical; of heavy, heat-treated aluminum plate; rolled and seam-welded . . . assuring maximum strength against internal or external pressure and side stress. Enclosure tightness is assured.

Accessibility of Enclosures. Telescoping of enclosures simplifies inspection and maintenance of insulators and conductor joints. Adequate clearance facilitates telescoping and alignment. Longitudinal gaskets are eliminated. Circular, extruded, neoprene gaskets, retained by two-bolt clamping rings, make assembly easy and assure tight joints. Enclosure ends are not flanged. Small supporting feet reduce weight and provide smooth cylindrical exterior.

Coordinated Design. Westinghouse isolated phase bus is coordinated in design to assure long, economical service with minimum maintenance—and to reduce field assembly time by permitting large assembly shipments, limited only by shipping and handling facilities.

For complete facts, call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

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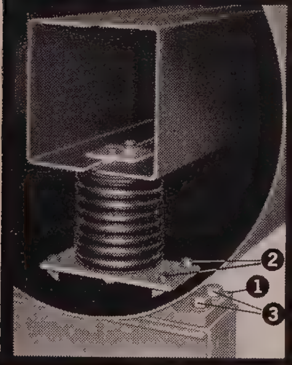
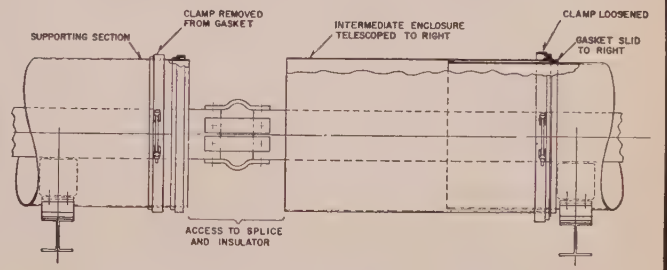


Only One Insulator Is Required at each main conductor and enclosure support location. Enclosure tightness is assured by these arrangements:

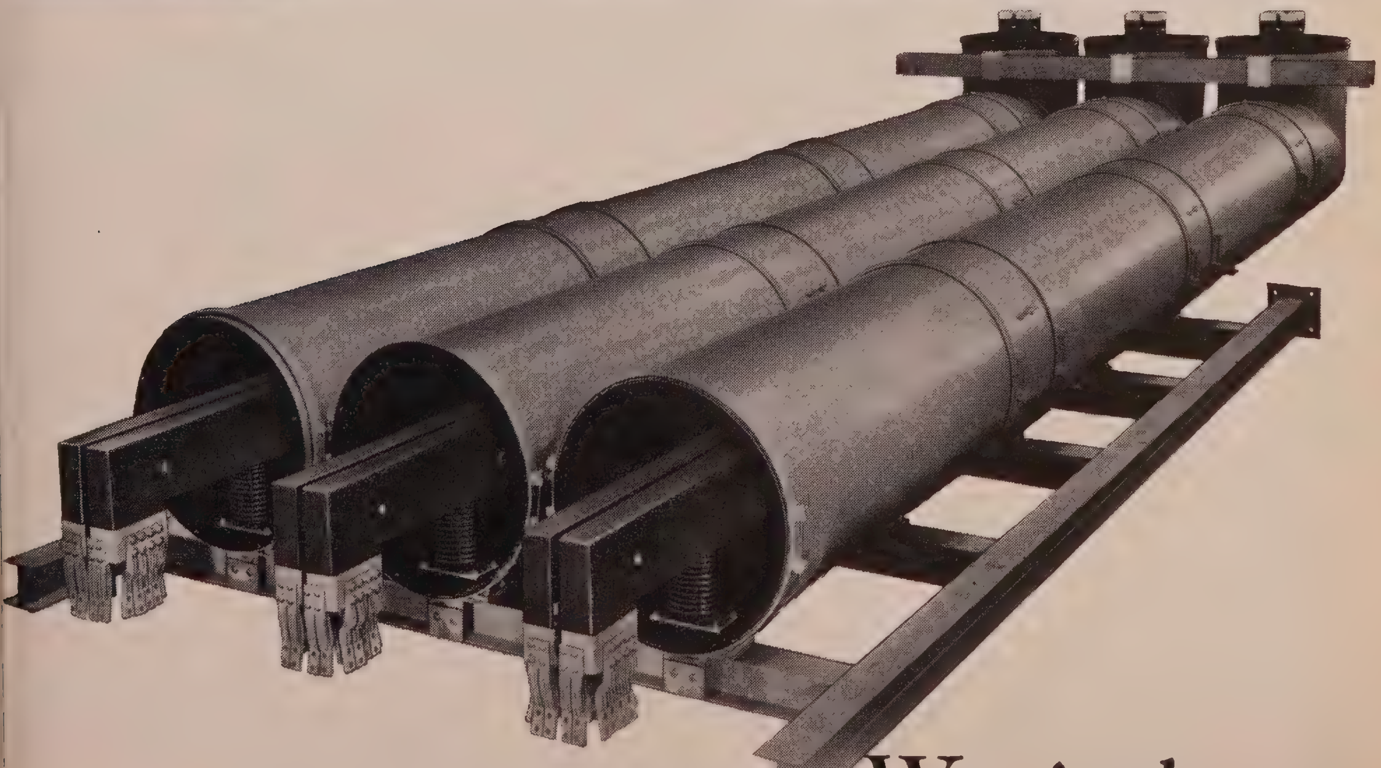
1 Welded-in support of high-strength extruded aluminum.

2 Resilient insulator mounting plate bolts dead-end in extruded support.

3 Assembly mounting bolts are external to the enclosure.

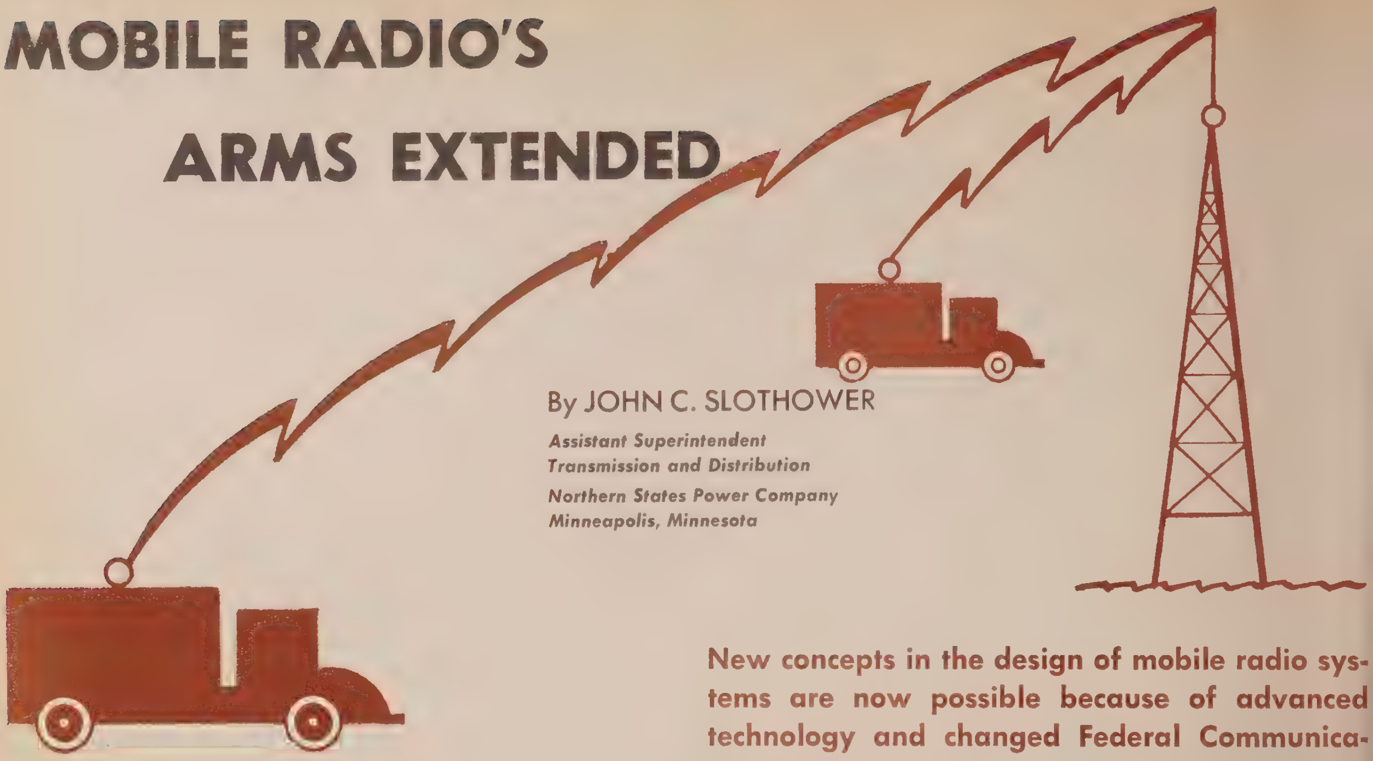

SUPPORTING SECTION
CLAMP REMOVED FROM GASKET
INTERMEDIATE ENCLOSURE TELESCOPED TO RIGHT
CLAMP LOOSENED
GASKET SLID TO RIGHT
ACCESS TO SPLICE AND INSULATOR

Telescoping Enclosure provides ready access to insulators and conductor joints for inspection or maintenance.



YOU CAN BE **SURE**...IF IT'S Westinghouse

MOBILE RADIO'S ARMS EXTENDED



By JOHN C. SLOTHOWER

Assistant Superintendent
Transmission and Distribution
Northern States Power Company
Minneapolis, Minnesota

New concepts in the design of mobile radio systems are now possible because of advanced technology and changed Federal Communications Commission rules.

MOBILE RADIO users have recently been offered new tools which make practicable more versatile and usable systems than have ever before been possible. Some of these tools stem from technical developments while others come from regulatory advances or changes in rules governing mobile radio use.

Typical of the type of tools available in recent years are: coded-squelch equipment, better and more refined selective calling units and tone signalling equipment.

Good Antennas Easily Available

Antenna design has come far in the past five years. Antennas of reasonable size are available to cover areas of almost any shape. Horizontal gain for mobile system UHF omnidirectional antennas has gone as high as 10 to 12 db in commercially available stock models and even higher gains can be achieved on special order. Directional antennas can be had in "off-the-shelf" models with forward gains of over 20 db, a far cry from mobile radio antennas available ten years ago when the first big expansion in mobile radio use took place.

The philosophy then generally used was that the only solution to coverage problems was to get the antenna as high off the ground as possible and to use a maximum amount of power. It is all too unfortunate that some of the systems designed with this philosophy in mind are still in existence and still operating. It is also unfortunate that there are still users who believe in it and apply it to new stations and new equipment being licensed and installed today.

Sensitivity, Selectivity Jump

Receiver sensitivity and selectivity have both increased by leaps and bounds in recent years. This, coupled with increases in antenna gain, has greatly increased talk-back range of mobiles. Talk-back rather than talk-out has always limited a two-way system's reliable range.

With increased receiver selectivity has come a corresponding increase in receiver and transmitter stability. The combination of these two in turn improves reliability and performance greatly. The likelihood of a given transmitter drifting out of a given receiver's useful bandpass is greatly reduced.

Transistor power supplies for mobile equipment have improved performance by eliminating vibrator noise. Elimination of the vibrator also reduced maintenance by a significant amount inasmuch as vibrators have always been responsible for a great deal of trouble.

The recent introduction of the long-awaited completely transistorized receivers and partially transistorized transmitters in mobile equipment is still another step towards improved performance and reliability and reduced maintenance in mobile systems.

All in all, even with no special system design features the usefulness and reliability of mobile radio equipment has improved so much in the past ten years that licensees have been able to place greater and greater dependence on it.

The combination of regulatory advances and advances in the art have resulted in some of the most interesting "tool" developments. How regulatory changes and equipment design advances have worked hand in hand to produce new tools is demonstrated in the field of "split channels." Manufacturers have had available for some time equipment which could operate on approximately half the bandwidths required for mobile system operation. In the 30-50 mc band this meant a bandwidth of 20 kc instead of 40 kc and the ability to operate with a modulation deviation of ±5 kc instead of ±15 kc. Correspondingly improved equipment has been available in the 150-160 mc and the 450-460 mc bands.

After giving users adequate warning that channel widths would be narrowed down and tolerances tightened up, the Federal Communications Commission issued in 1957 and 1958 a number of orders and rule-makings which had the effect of implementing these so-called "split-channels."

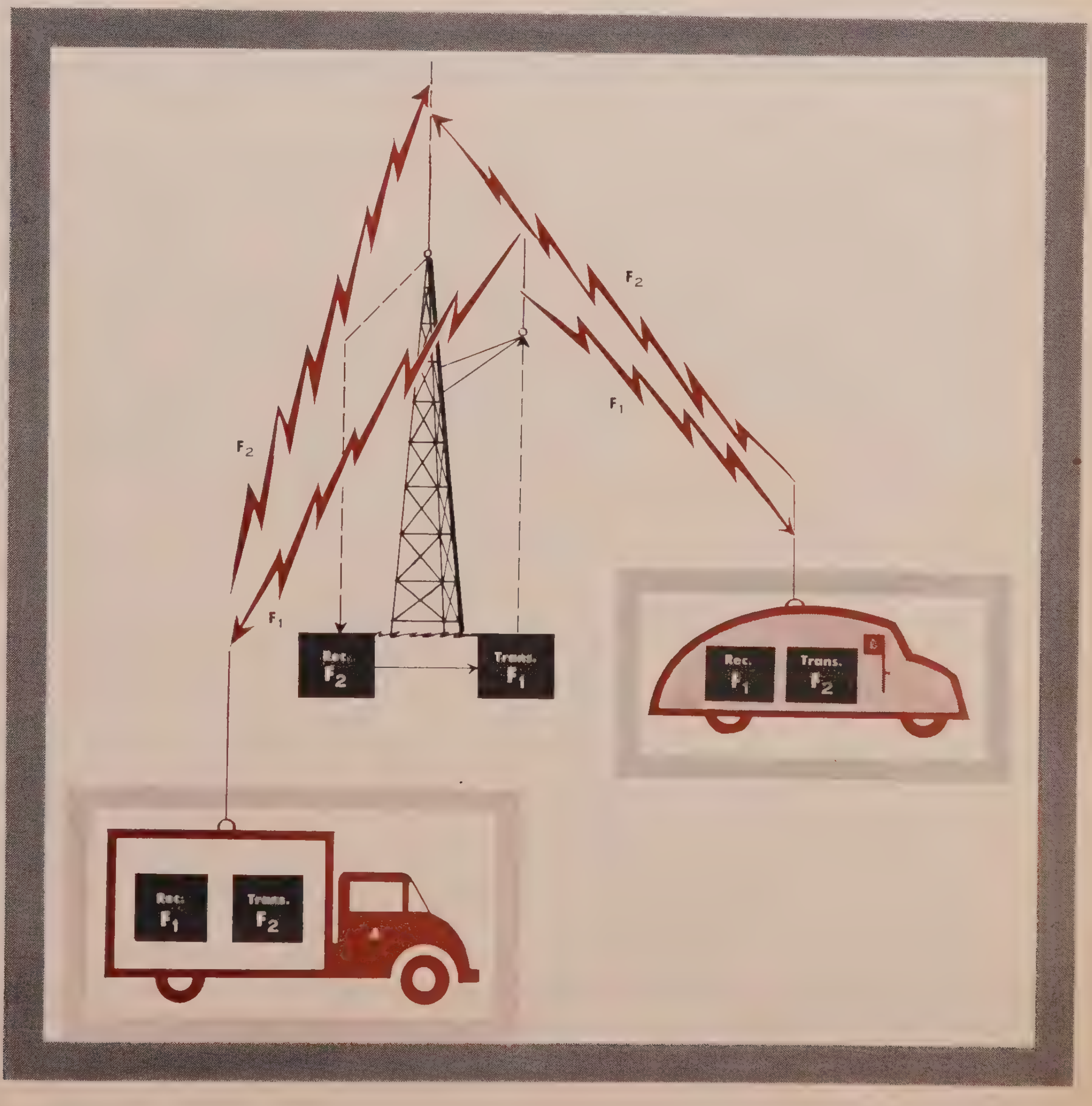
This splitting produced approximately twice as many channels in the same amount of radio spectrum space. It might be asked just how this can be considered a "new tool" for mobile radio users. The answer is that the new frequencies have enabled some licensees who could justify a second or third frequency—but for whom none were available—to expand their use of mobile radio and re-design their systems, in many cases taking advantage of "mobile repeater" or "mobile relay" type of operation. This type of system is shown in Figure 1. It can be seen that a mobile relay system requires two frequencies and this is one of the principal reasons that it has not been more widely used.

The mobile relay type of system is specifically permitted in FCC rules to allow mobile-to-mobile communication over extended ranges. Normal car-to-car range varies from less than a mile in the 450-460 mc band to a possible 20 to 25 miles under good conditions in the 30-50 mc band. On a reliable basis, though, it is usually limited to a few miles in the 150 or 30-50 mc bands.

In any case, these ranges are very often inadequate for many of the types of operation common to utility radio systems where supervisors in the field need to communicate directly with other mobile units to control switching and repair operations. The relay system effectively extends the mobile-to-mobile range to twice the base-to-mobile range.

An equally valuable feature of the mobile relay system is the possibility of various fixed repeater installations in a system. These allow a mobile unit to talk back to its main base station from beyond the normal base-to-mobile range. This type of operation is shown in Figure 2. Fixed repeaters are unmanned and can be located in the most desirable location from a radio coverage standpoint without regard to the availability of personnel to man the station.

When a base station is talking to a mobile unit "through" a fixed repeater station the base must go on the air as a "mobile"—that is, it



g. 1 — With more
annels available,
stems can take ad-
antage of repeater
ations. Truck-to-truck
ntact distance here
effectively double
e base-to-mobile
nge. As truck A
ansmits on F2, re-
ater station picks it
and transmits on
. Truck B picks up
from repeater. An-
ering, truck B trans-
ts on F2, repeater
ks it up and puts
on F1 to be picked
by truck A.

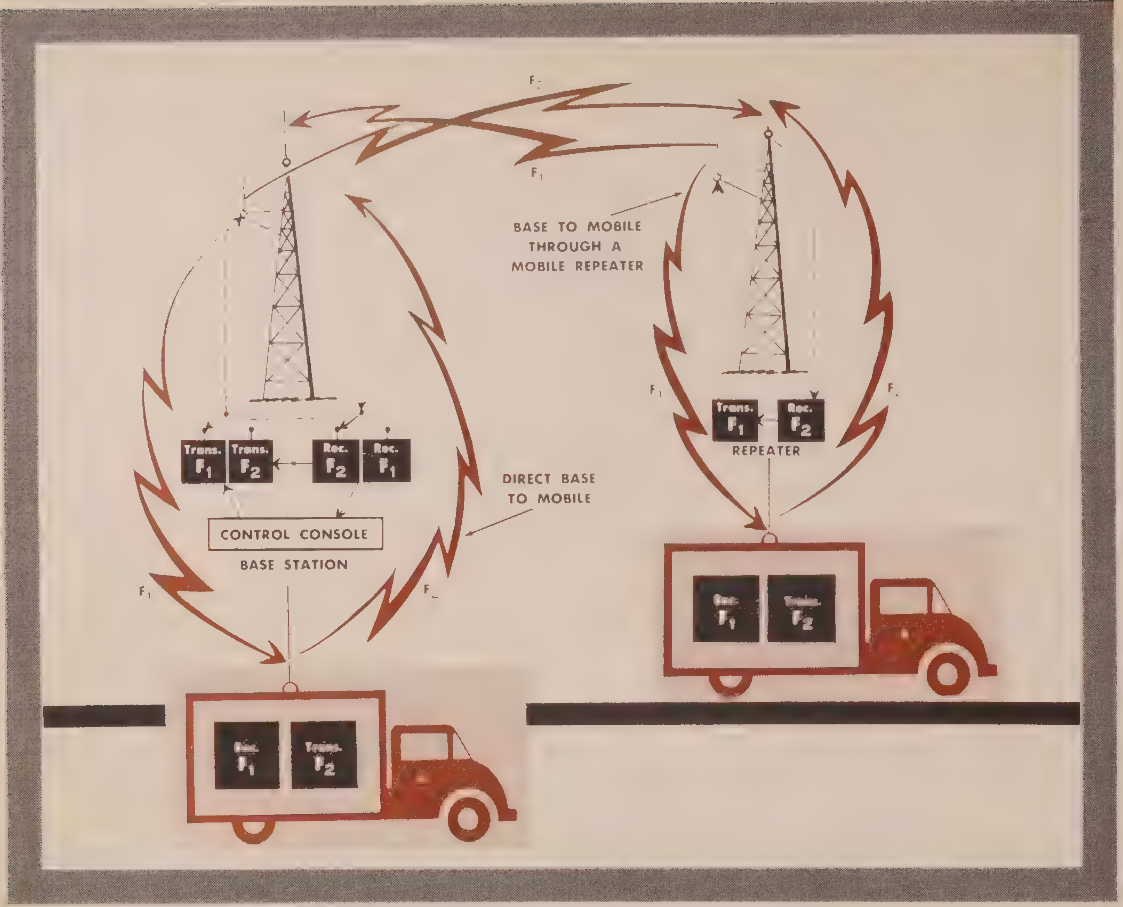


Fig. 2—By a switchin arrangement, the bas station can talk directly to a mobil unit, or can talk t the unit through a repeater station. Whe talking directly t Truck A, base statio transmits on F1 an receives on F2. Whe talking to Truck base station transmit on F2 which is retransmitted by the repeate on F1 to reach Truc B. Base station i shown talking t Truck A.

must transmit on the same frequency that the mobiles use for transmitting. The base signal is picked up by the fixed repeater and re-broadcast on the normal base station frequency which is then picked up on the mobile receiver.

Coded-squelch is a valuable tool because it can make systems more selective. Originally developed to eliminate interference, both from "skip" and geographically adjacent stations, it uses a tone-operated relay to "mute" the receiver until a carrier with the proper sub-audible tone or combination of tones is received. Thus a given receiver, base or mobile will allow the operator to hear only transmissions from stations in its own system. Annoyance and interference to the operator is reduced with consequent reduced operator fatigue and chance of error.

Coded-squelch has other advantages, however, that have not been widely applied nor even generally realized. A single mobile unit can be equipped with several different tones so that by selecting the proper one he can talk to any one of several base stations within range. This type of operation is shown schematically in Figure 3. Likewise, a base station operator can select a mobile unit or group of mobile units.

In a similar manner, a base station operator can select any one of several fixed repeaters by selecting the proper tone. All in all, coded-squelch and mobile relay types of operation can be combined to give an extremely flexible and efficient system.

These, however, are only a few of the things that can be done with presently available equipment under existing FCC rules. The systems described so far have been relatively simple with only local control circuits involved. It may often be desirable to control a number of base stations from a single control point over distances greater than that possible with the single "hop" to a fixed mobile repeater.

In such a system, control links to outlying base stations could be VHF, or UHF radio control links, microwave circuits or land lines. In any case, the system, in so far as the base-to-mobile operation is concerned functions essentially the same.

NCUR Petition

The National Committee fo Utilities Radio, speaking for th licensees in the Power Radio Service, has recently petitioned FCC fo permission to use tone signallin devices on mobile frequencies t perform functions at remote locations. Other mobile services hav already been allowed to do this an if the petition is granted it wil open up a whole new world of possibilities for mobile radio.

Coded tones or coded pulse could be used in the electric utilit industry to operate remote lin switches or capacitor ban switches. Use of such a signallin system on the mobile bands woul be most efficient where the function performed is one that woul normally be performed manuall under voice directions given ove mobile radio. Such use should actually decrease the amount of mobile channel traffic rather than increase it. Where continuous or frequent use is necessary such as i telemetering or relaying, lease circuits, wire circuits, radio rela or microwave should, of cours continue to be used, since one tel metering function would completely tie up a base station so that no two-way communication could take place.

Check-back functions from a remote, unattended transmitter on the mobile frequency have been permitted for several years now so that outages on an electric transmission or distribution system can be automatically signalled to a central point.

Use of this check-back feature involves small remote transmitters which, when triggered by opening switches, breakers or the operation of fuses, send back coded oulses to the base station. These ire received and recorded so that he operator will know which devices operated. Here again the net ffect is to reduce traffic on the nobile channel rather than to load t up. This is true inasmuch as very robably a fair amount of talking ack and forth would be required efore the patrolman found the switch or fuse which had caused the outage.

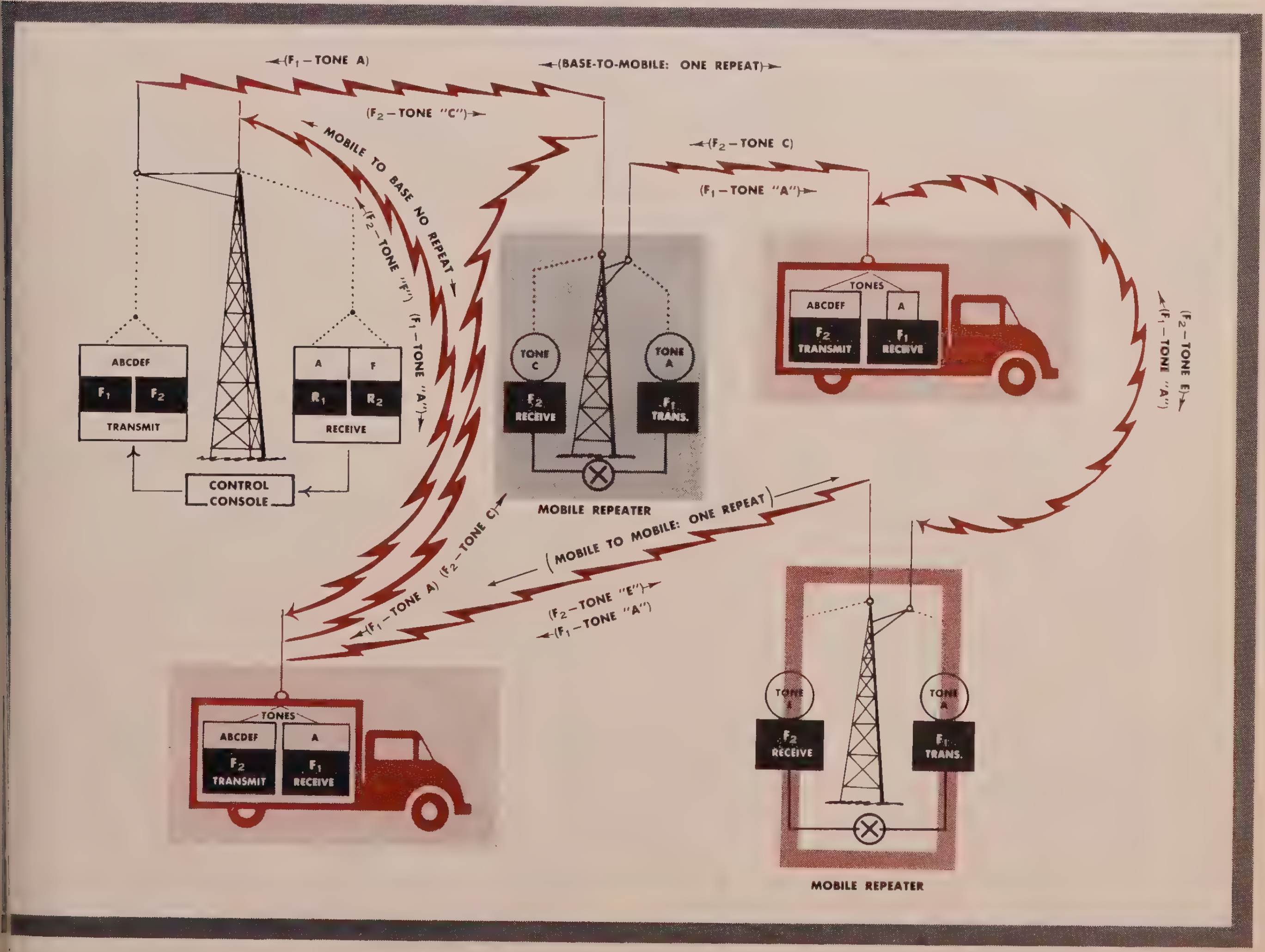
An "ultimate" system operating on mobile channels, may, then, utilize any or all of the above-described features. On an "ultimate" system there might be several central base stations, controlled from several points and each base having several satellite mobile repeaters. The base stations and control points can be linked together by wire, microwave or radio relay. There is no limit to the combinations and arrangements which can be made with systems of this type.

Any mobile unit operator in such a system would have a choice of any base station or repeater and could select the one over which he wished to talk. The mobile unit may also be able to select the specific control point with which it wishes to communicate so that other operators are not bothered.

In addition, a number of remote switches can be controlled by coded tone pulses on mobile frequencies and a number of these switches or reclosers are equipped with automatic transmitters to signal back when a fault or trouble causes them to operate.

Still farther in the future, perhaps, but even now within the realm of available techniques is the use of facsimile in mobile systems so that switching instructions and other orders will be printed out in the truck cab, reducing the chance of errors.

Beyond this it is hard to predict what new developments may become available to the designers and users of mobile radio. Many of the present tools were only gleams in the eyes of equipment designers ten years ago. It will be extremely interesting to see how the equipment, the needs of users and the rules under which they operate evolve in the next decade. There is little doubt but that the predictions will be no wilder than the reality.



. 3—More than one repeater station is available to a truck equipped with several different coded-squelch tones. Thus, base stations other in the main base station can be reached by the truck. Flexibility is given to main base station, too. Note how main base station could work ough various repeaters to reach trucks and how each truck will be heard only by the base station or repeater which it selects.

DO-IT-YOURSELF METER TEST CONSOLE

A home-made meter test device for special, less frequently encountered tests is proving its worth in practice.

By JAMES W. ALTHOUSE, JR.,

Assistant Superintendent
Meter Division
Philadelphia Electric Company

METER-SHOP PERSONNEL of the Philadelphia Electric Company recently conceived the idea of developing a new meter test console, and then proceeded to carry out their idea on a do-it-yourself basis. Facilities were needed at a central location in the meter shop for calibrating portable test equipment and for testing non-standard metering devices of relatively high complexity.

A design was prepared for a meter test console that featured safety to personnel and to equipment, while offering maximum accessibility to testing supplies and loads, yet still maintaining versatility to handle special tests regularly demanded of this meter shop. The do-it-yourself approach was limited only by choice of available standard components, thereby avoiding any local fabrication of items that were readily available on the market.

A modular type of instrument enclosure system was chosen as the foundation on which to build the test-console components. This equipment allowed completion of an installation that has the custom appearance of a factory product, while enjoying do-it-yourself savings and allowing maximum design flexibility and options.

The modular enclosure system was found admirably suited to a dual-position design, so provisions were made to accommodate two operators. Each operator has independent choice of services and loading devices so that separate and dissimilar tests can be conducte simultaneously. This proved to b an economic advantage in purchasing the enclosure, since the onl extra expense resulted from providing one extra formica writin shelf.

Safety Built In

Safety to operating personne and equipment was the most important design consideration. Eac service wire has its own separat breaker and the enclosure is we grounded. Most important, the entire test console is of dead-fro construction. That is, all recept cles, plugs, binding posts, switche etc., are insulated or protected t prevent accidental contact by pe sonnel or to prevent accident short circuits.

Test loading devices were bui into the console with a choice either resistance or phantom tran ormer loading at each test position. Separate, calibrated phase-shifting ransformers allow load phase an- les to be set precisely, and either esistance selector switches or load- ng transformer rheostats can be et from either panel to adjust test- ng loads.

Convenience and comfort of op- ration are provided by making all onnections accessible from panels irectly over the work shelf. Con- rols and switches are also panel nounted, or shaft extensions bring djustments within easy reach. mple space on the work shelf al- ows for disposition of test instru- ents, and connecting leads can be ept relatively short so that circuits re easily checked.

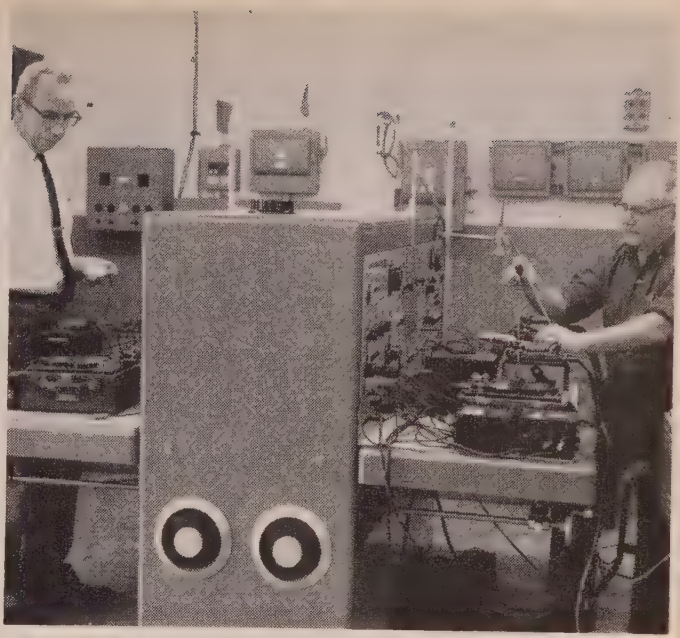


Fig. 1—Two quite dissimilar tests can be conducted simultaneously on Philadelphia Electric's do-it-yourself meter test console.

Complex metering devices and est equipment are calibrated with is new console on a routine basis, here frequency of testing does not arrant provision of specialized est facilities for each type. Thus, se factor of the new console can be ept high, where otherwise special cilities for each type of infre- uently tested device would tie up uipment and facilities needlessly. he relative ease of wiring and of aking adjustments minimizes set- expense for these infrequent asses of tests which include cali- ation of power-factor test sets, mpensated and compensating me- rs, thermal demand meters, and -cycle meters.

A one-of-a-kind device, such as is test console, lends itself most onomically to do-it-yourself construction where the usual economies from repetitive factory production are not possible. In any event, design effort by the specifier cannot be avoided; but by do-it-yourself, drawings can be nothing but simple sketches and specifications can be reduced to catalog descriptions of component parts. Best possible use of the final product results through giving users a major voice and interest in design stages. Then, as the project reaches the assembly stage, wiring and design features are so thoroughly understood that assembly proceeds rapidly and future maintenance offers no problem. Thus, where user design effort cannot be avoided for a special project such as this, it becomes most economical to organize for do-it-yourself.

Home Construction Should Be Limited

Once the project is launched, care must be taken not to be carried away beyond reason. The do-it-yourself must be confined to assembly of such components as are readily available on the market. Local fabrication should be limited to drilling of panels and installation of mounting brackets. Even such items as shaft extensions, guides, and bearings should be purchased on the open market. Failure to do so will result in wasted time by producing items that are available elsewhere at savings resulting from mass production.

Temptations often arise to make a gimmick locally instead of determining where to purchase it locally or to redesign around the problem. Any confusion regarding these restraints can easily lead to a project where do-it-yourself could prove very costly. The project leader is well advised never to let this out of his mind.

Where appropriately conceived and diligently applied, the do-it-yourself project has a proper place in industry. The new meter test console at the Philadelphia Electric Company has proved itself from both operational and economic viewpoints. Evidently, many other projects similar to the one described here can be undertaken profitably.

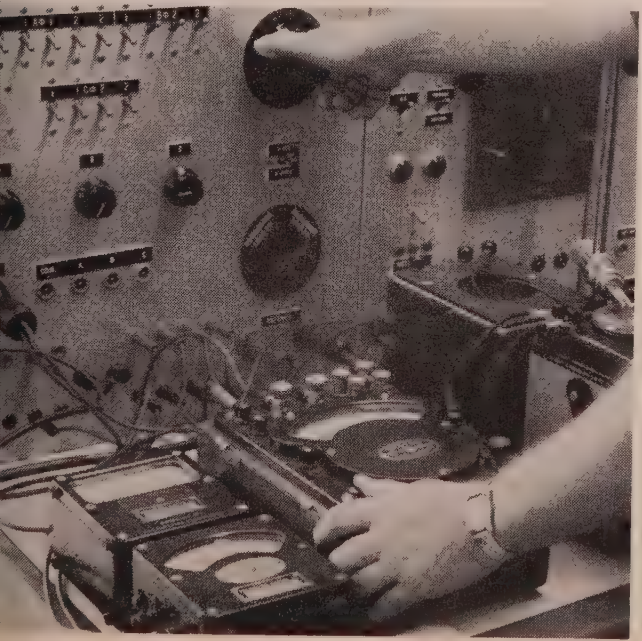


Fig. 2—The dead-front control panel offers flexibility with maximum safety to personnel and equipment.

OFFICIAL UNITED STATES NAVY PHOTOGRAPH

This great seaborne health center will carry a new kind of aid abroad—*with your help.* Part of the people-to-people project Hope, it will enlist 200 specialists in sharing our health skills.

Ambassador with a blackboard, the Hope specialist will help the often woefully few local medical technicians train helpers. The result: many more hands. And that means one Hope dollar is multiplied many times over.

YOUR HELP CAN COME BACK A HUNDRED TIMES OVER

One local doctor for 100,000 people. These are the odds Hope may face. Yet Hope can mean so much. The health of this child. The health of five Indonesians. *Trained* hands and only a dollar's worth of penicillin can cure them of crippling yaws.

If enough of us help, the S.S. Hope will be outbound in 1960. First port of call: Indonesia. A bold health project called Hope will be underway.

The need is crucial. Many places, too many health hazards exist. Too many people robbed of the will to live. Too few hands to help. Often, a doctor for 100,000.

Hope's approach is *practical.* Help where a nation's doctors ask help. Help them help themselves to health. By training, upgrade skills—multiply hands. Hope's doctors, dentists, nurses, and technicians will man a center complete to 300-bed mobile unit and portable TV.

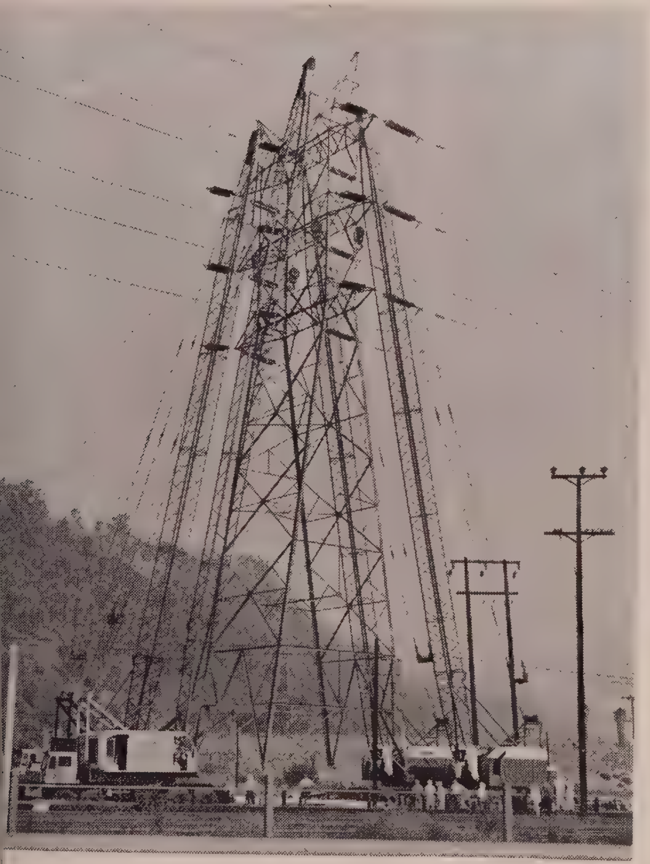
You can not only make every dollar do the work of many, you can earn a priceless dividend. With health comes self-respect. People at peace with themselves are less likely to war with others.

Hope is *yours* to give. It's a people-to-people project. For one year's worth, 3½ million Americans must give a dollar. Don't wait to be asked. Mail a dollar or more now to HOPE, Box 9808, Washington 15, D.C.

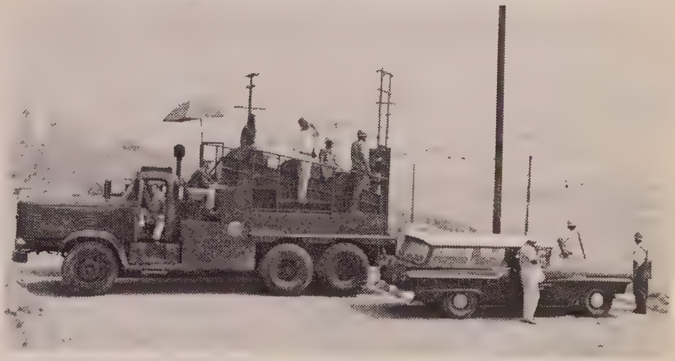
ADVERTISING COUNCIL PUBLIC SERVICE

HELP LAUNCH HOPE

FOUR CRANES, TWO WINCHES LIFT LOADED DEADEND ANGLE TOWER



50-ton Capacity Cranes co-operate closely as the 135-foot transmis- tower is lifted. Note all transmission lines are in place.



Across the Los Angeles River Channel, winch trucks closely couple-in with the operation and provide the necessary tension to compensate for the 11,700-lb. side pull from the angled line. Communication is by two-way radio.

Just about two and one-half hours after the operation had begun, crews prepared to bolt-up as cranes gently lower tower into place.

uperior synchronization of four nes, two winches, and level- ded crews allowed Los Angeles partment of Water and Power to e a fully-loaded angle deadend er ten feet, and set it on an ex- sion structure.

nvolved was a 15-degree angle er located near the Los Angeles er channel, which had to be ed to provide clearance for the den State Freeway. It was the time the Department had at- pted to raise such a tower with lines in place. Problem was to pensate for the 11,700-lb. side of the lines during raising and ering operations.

our rented 50-ton truck cranes with 130-foot booms surrounded the 50-ton (including line load) 135-foot high tower. While it was ticklish enough to coordinate the lifting cranes, even more ticklish and difficult was the side pull compensating operation.

Winch Makes Debut

Two Department winch trucks on the far side of the river channel provided the compensating side pull to cables attached to the tower. Tensionometers were used so that winch tension could be adjusted to offset exactly the circuit side pull.

One of the two winches used was the Department's new 40,000-lb. winch truck, which made its debut on this job. This highly mobile rig was designed and built in the Department's General Plant Division Shops. Specifications were provided by the transmission, trouble and street light section.

After the tower had been lifted to the necessary height, pre-fabricated sections of the 10-foot extension were raised into place by two of the Department's self-propelled cranes and bolted into place by Department crews.

Close co-operation between the various units involved resulted in job completion in only two and one-half hours from the time the tower was first lifted until the extension was bolted into place.

Two of Three Biggest Loadbuilding Appliances

Gas Narrowing Gap In Units Sold During 1959

Among the three largest loadbuilding appliances, ranges, water heaters, and dryers, only sales of electric ranges should give the electrical industry anything to crow over. In the other two areas, gas appliances continued to gain ground.

Sales of ranges last year showed a 24.5 percent increase for electric models, compared to a 6 percent increase for gas. This increase is responsible for bringing the total ratio of gas ranges to electric ranges down to 1.19:1. According to Ralph Sorenson, manager, utility sales department, Westinghouse Electric Corp., 1960 may be the year when electricity will go ahead of gas.

The largest problem area seems to be in the water heater field. Last year electric water heaters showed an 8 percent decrease in factory shipments while gas water heaters showed an increase of 10.5 percent.

In units, this meant that compared with the previous year, 282,600 more gas water heaters were shipped out to be hooked up to someone's gas mains or bottled gas tanks, while electric models were slipping back by 65,900 units. This makes a difference of almost 350,000 units lost to the electric industry.

Another cloud on the horizon hovers over the industry in the clothes dryer field. While shipments of electric models were still far ahead of gas models the electric industry lost another 2.7 percent of the market to gas. This marks th seventh year in a row that ga models have gained on electric dry ers. In that period their share o the yearly total has jumped fron 22.8 percent to 34.4 percent.

If the decade is to become th "Electrifying Sixties," some vigor ous loadbuilding activities are indi cated, concluded Mr. Sorenson.

Units Shipped — 1957-1959

	1959	1958	1957
Ranges			
Electric	1,686,000	1,354,500	1,365,000
Gas	2,010,500	1,896,700	1,986,600
Ratio (Gas to Elec.)	1.00:1.19	1.00:1.40	1.00:1.44
Water Heaters			
Electric	757,600	823,500	800,000
Gas	2,956,000	2,673,400	2,532,000
Ratio (Gas to Elec.)	1.00:3.90	1.00:3.25	1.00:3.16
Dryers			
Electric	905,192	809,594	868,557
Gas	476,583	376,468	392,085
Ratio (Gas to Elec.)	0.53:1.00	0.47:1.00	0.45:1.00

Largest Unit In Company History

General Electric To Build 650 Mw Unit For TVA

General Electric Co. has been awarded a $16-million contract to build a 650-mw turbogenerator for TVA. Details of the unit, largest ever built by General Electric, were not immediately available.

According to information released by TVA, the turbogenerator will be part of a second generating unit for the Paradise steam plant located on the Green River in western Kentucky. Delivery is scheduled for 1962.

William S. Ginn, GE vice president and turbine division general manager, said the order will have no immediate effect on Schenectady GE's employment level.

Last August GE received an $18-million contract to furnish TVA with a 600-mw generator which is scheduled for delivery next year. Just before receipt of that order, Mr. Ginn forecast a 1,000 employee decline in the turbine division's employment level, but predicted th employment would pick up aga in 1961.

He also said at that time th TVA had placed options on thr additional units but was holdi final approval on them until lat This new order is one of the thr

Total cost of the entire unit w be almost $34-million. Babcock a Wilcox will provide the boiler the second unit at a cost of $13 million.

GE Simplifies Capacitor Bank Pricing

General Electric has simplified the pricing of high voltage power capacitor banks for distribution, subtransmission, and transmission use.

The company states that the new straight-line pricing method will be a boon to utility engineers and purchasing agents and will make it possible for them to determine with a minimum of time and effort the prices of any high voltage capacitor banks for budgetary or engineering purposes.

According to W. G. Hart, manager of power capacitor sales, it is ow only necessary to multiply the ank kilovars for any voltage class rom 4 kv to 230 kv by $2.40 net per ilovar. The $2.40 figure is GE's urrent price per kilovar for unrounded wye banks with standard oltages. To this must be added nly the prices for base insulators r substructures, if required.

The previous pricing method used y the company required first the etermination of the exact arrange-ents of the racks and insulators nd then, totalling of all prices for ach of the many components in ach capacitor equipment. Due to e complexities of the old method, tility buyers found it extremely ifficult to estimate prices of such quipment.

MELVILLE STEIN, Pres., Leeds & Northrup Co.,) Philadelphia, is shown receiving the Annual ward of the Philadelphia Chapter, Society for dvancement of Management. The Award, with ation for "Outstanding Contributions to the dvancement of the Arts & Sciences of Manement," is being presented by John A. iley, City of Philadelphia.

MINERAL WOOL products of
Different materials — Different thicknesses
BUT ALL ARE
R-19
National Mineral Wool Association
ROCKEFELLER CENTER
NEW YORK, N.Y.

Reasons for establishment of new standards for insulation for electric house heating are demonstrated by F. H. Sides, executive officer of the National Mineral Wool Association. Although the materials shown possess different thicknesses, densities, and thermal characteristics, they all provide the same installed resistance to passage of warmth. Products shown meet the "R-19" requirement for ceiling insulation under the standard for electrically heated or air conditioned houses.

Special Design for Power Companies

To Produce Complete Computer-Operated Systems

Complete computer-operated systems specially designed for the electric utility industry will be furnished through the joint effort of Republic Flow Meters Co. and Thompson-Ramo-Wooldridge Products Co. The two companies recently announced their agreement to cooperate in the design and production of the systems.

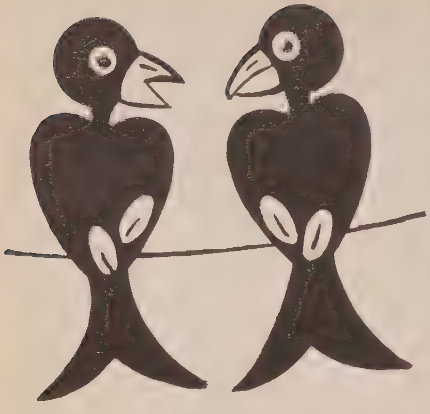
In a joint statement, William F. Crawford, Republic president, and Dr. Joseph F. Manildi, TRW Products general manager, said, "Republic's leadership in electronic control and valving systems for steam boilers and TRW Products' leadership and success in digital computer control systems for industrial applications provides power industry buyers with a unique pool of knowledge and experience for planning automated power plants."

The two companies will cooperate in engineering, installing, and servicing complete valve, combustion control, data logging, alarm scanning, and computer control systems.

Copyright Protection Guaranteed

Consent Decree Favors G & W Electric Co.

According to a consent decree filed in the United States District Court at Chicago on March 7, 1960, ESCO manufacturing Company and its agents are permanently enjoined from: (a) Infringing on G&W Electric Specialty Co.'s copyrights, (b) Unfair competition with G&W Electric Specialty Co. in any manner by use of advertising material, books and literature containing information taken from G&W's copyrighted books, and (c) Further using in any manner or delivering and placing on the market and in the flow of commerce the book entitled "Esco Load Break Oil Switches."



"it's sure a good feeling to know that this wire is attached to Haley cross arms!"

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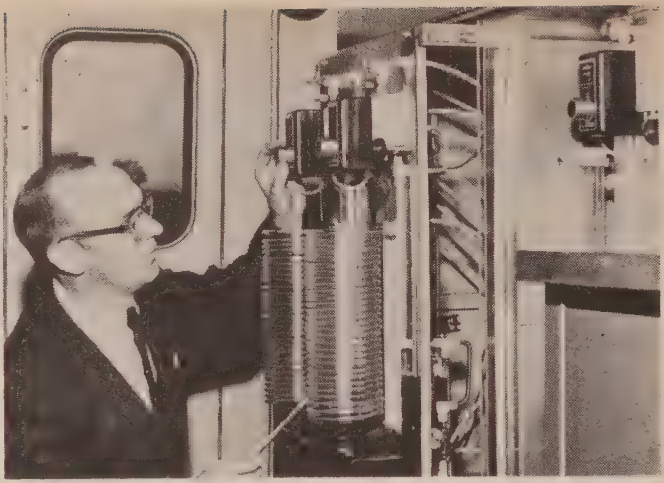

INTERIOR VIEW of Mobile Air Sampling Unit showing portion of the gas analysis systems which measure low concentrations of oxidant, nitrogen dioxide, nitric oxide, and sulphur dioxide in the air sample.

Mobile Lab Monitors Contaminants In Air

The mobile air sampling laboratory by Beckman Instruments, Inc. is equipped to make continuous quantitative analyses of contaminants in air sample drawn from the atmosphere and to chart a permanent record of the results. Housed in a paneled step-van truck, the monitoring instrumentation includes four air pollution analyzers and two infrared analyzers.

The analyzers are gas analysis systems for measuring low concentrations of various gases in the atmosphere. Separate analyzers are used for analysis of nitric oxide, nitrogen dioxide, oxidant, and sulphur dioxide. The Model 21 Infrared Analyzers are used to make analyses of carbon monoxide and hydrocarbons in the air sample. All monitoring instruments are designed to permit independent or simultaneous analysis.

The Sample Handling System is divided into two main subsystems.

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RAY-LINE

NEW IMPROVED DOUBLE DUTY PORTABL

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"Ray-Line" Emergency Lights are used by leading Utility Companies.

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3rd: Each new battery has its own steel case. No corrosion as occurs with separate battery containers.

4th: A powerful Searchlite Ray for distant line inspection and a Floodlite for nearby use.

5th: Lamp unit constructed of non-corrosive aluminum to give years of service.

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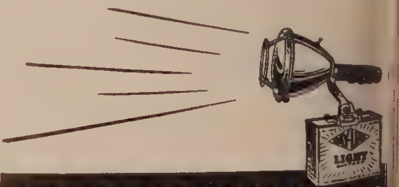
STRAIGHT UP FOR POLE WORK.
STRAIGHT DOWN FOR MANHOLE WOR



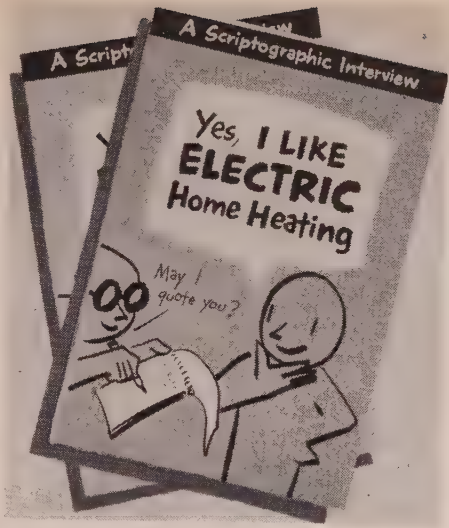
THE PORTABLE LIGHT CO., INC
216 WILLIAM STREET · NEW YORK 38, N. Y.

The first subsystem is operated under pressure from two Bell and Gossett pumps; this subsystem delivers the sample to the two infrared analyzers and also pressurizes the water system air tank. The second subsystem is a vacuum system; the sample is drawn through the four air pollution analyzers by means of two Gast pumps.

Both sample handling subsystems draw sample air from a common sample stack. The stack, which is polyethylene-lined to prevent con-amination of the sample, can be raised as much as 20-feet above the op of the van.

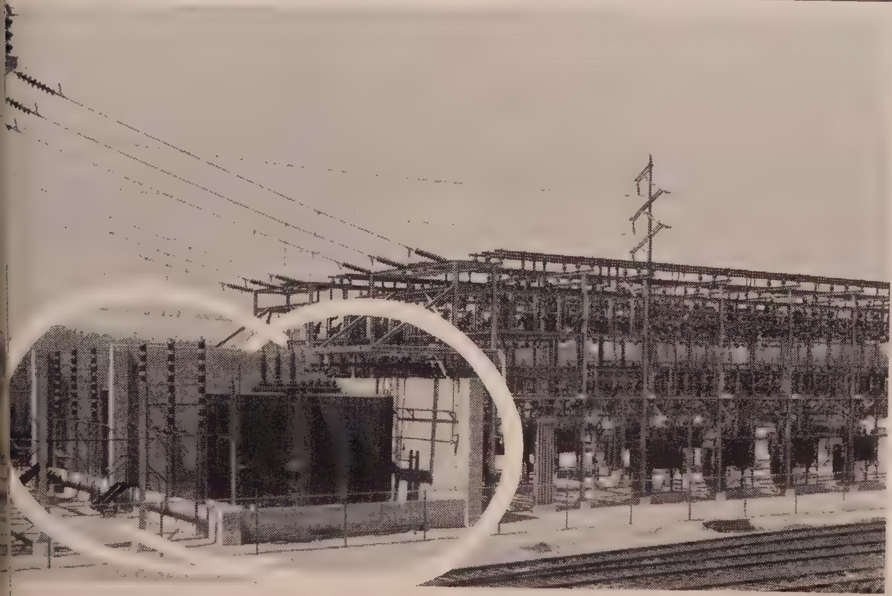
Once the instruments are standardized, the van can be parked in a urvey area for day-long periods vithout an operator, since instrunent operation and recording are ontinuous and automatic.

The Air Sampling Unit includes trailer which has a 5000 watt gasline-powered generator to provide lectric power for instruments, air umps, work lights, ventilation fan, nd auxiliary equipment. A 250-oot power cable permits wide sepration between trailer and van.



Booklet Sells Electric Heat

The advantages of electric heat have been set forth in a pleasant, easy reading booklet entitled, "Yes, I LIKE ELECTRIC HOME HEATING," published by the Channing L. Bete Co., Inc. The booklet is written in scriptographic style and is intended for use by electric companies and electrical contractors as a general purpose information piece in connection with promotional activities on electric house heating.



A DELTA GROUNDED TRANSFORMER
will usually SAVE SPACE AND MONEY
when a grounding transformer is required.

Technical information and list of manufacturers licensed under U. S. Patent No. 2,488,628 and Canadian Patent No. 479,050 will be sent on request.

H. L. HOEPPNER Park Ridge, Ill.
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*Trademark

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"Our transmission-line construction is done on a 'bid-job' basis. But we insist on reliable sources for *every item* of work and equipment, because we must protect customer service and large investments.

"Take even a relatively small item, like connecting materials . . . we find that the Fanner folks, both Factory and Agent, are the kind we like to deal with. They *measure up* . . . Quality, Service, Price, Performance . . . and, above all, *INTEGRITY*."

No one knows better, than a Purchasing Agent, "Who's Who" among the Suppliers.

A-1607A

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Protect short-span T&D lines at supports

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Protects conductor at tapping points

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For dead-ending strands and conductors

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Join two ends of conductor wire

PLASTIC PRODUCTS . . .
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NO MORE
DARK STREETS!

Save
UP TO
$50,000
PER
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WITH

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STREET LIGHT
GLOBES

- *Shatterproof*
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Over 10,000 in use by leading Utilities and Municipalities

Now . . . an unbreakable fiberglass street light globe that defies even the most vicious vandalism. These new Plastic Age globes answer the most rigid requirements for an outdoor light globe. *Excellent light transmission properties.* Save replacement time — *eliminate hazards* to pedestrians, automobiles and utility work crews. Weigh 1/10th as much as a glass globe. May be stacked one into the other *without* warehouse breakage.

Available for all major types of luminaires.

NO BREAKAGE
FROM BB'S,
PELLETS,
OR ROCKS

No penetration from rocks, BB's or pellets. Small arms fire will enter but not shatter. Chopped glass fibers at hole edges tend to reseal to prevent insect entry.

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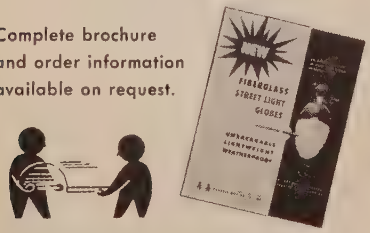


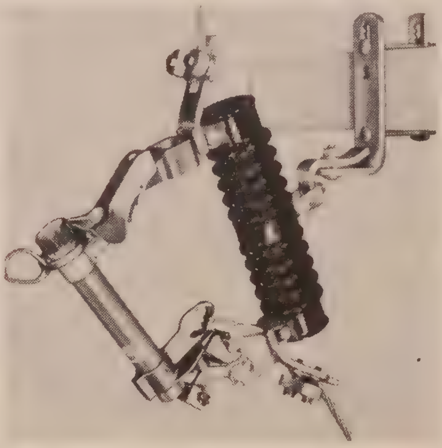
COMMERCIAL PRODUCTS DIVISION
PLASTIC AGE SALES, INC.
14300 DAVENPORT ROAD
MINT CANYON, CALIFORNIA

NEW PRODUCT DESIGN

Heavy Duty Cutouts

Type HX heavy duty cutouts in 100 and 200 amp load ratings on single insulator mountings or NEMA station post insulator mountings have been introduced by the **James R. Kearney Corp.** Dependable interruption over the full fault range is achieved by a highly efficient combination of expendable cap and small bore cartridge. Interrupting capacities are 10,000 amps at 7.8 kv, 8000 amps at 15 kv, and 6000 amps at 27 kv in the 100 amp rating, and 12,000 amps at 7.8 kv and 10,000 amps at 15 kv in the 200 amp rating. Self aligning high pressure silver plated contacts have high thermal capacity, while controlled spring loading of lower hinge assures positive ejection of fuse cables. High leverage pull ring may be operated with a standard switch stick.

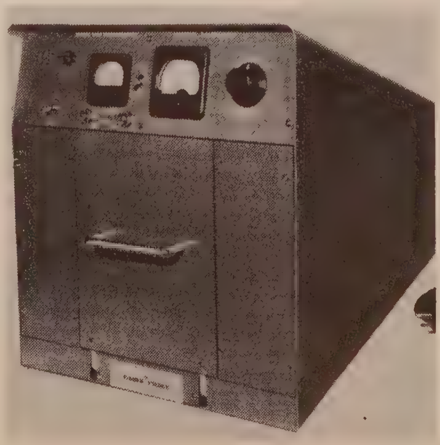
Circle item #24 on reply card

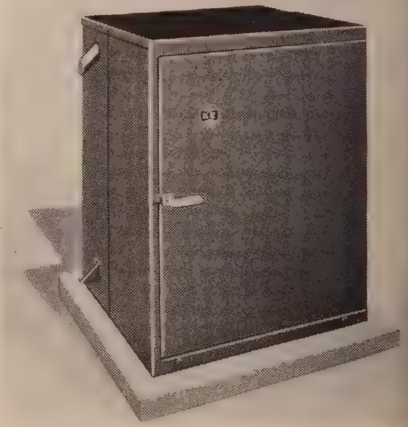


Calibrator

Fisher-Pierce Series 6100 Calibrator provides a fast, efficient method of adjusting photoelectric streetlight controls to operate at a desired foot-candle level. Interchangeable front allows for all types of control mountings. Blue light inside simulates actual operating conditions of North-oriented control and light level can be controlled by rheostat. May be used as a lab unit or in a truck for field tests.

Circle item #25 on reply card





Pad Mounted Transformer

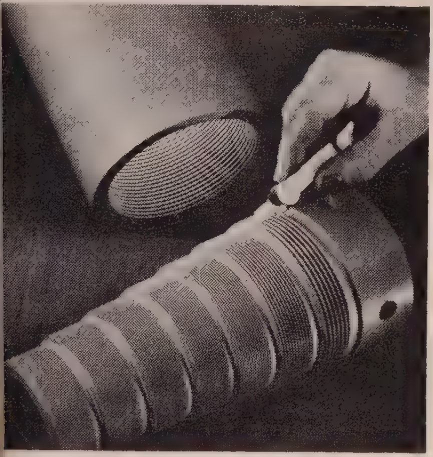
PMT Series transformers by **Kuhlman Electric Co.** offers pac mounted transformers designed fo residential underground distribution systems. Transformer is completely protected and has separat low and high voltage compartment in the cabinet. PMT operates at ful nameplate capacity, while an oil immersed load breaking primary selector switch allows sectionalizin at each unit to isolate cable fault and maintain service during repair

Circle item #26 on reply card

Thick-Wall Laminated Tubing

Thick-walled, paper backed Mi-
carta® tubing giving high strength,
good electrical properties, freedom
from cracking and resistance to
moisture is available from **Westing-
house Electric Corp.** for such uses
as lightning arrester barriers and
fuse tubes. For such uses it is equiv-
alent in performance to cloth based
naterials. Guaranteed crackfree up
o one inch wall thickness, it can be
nachined and threaded with as
nany as 28 threads to the inch.

Circle item #27 on reply card



urrent Transformer

Allis-Chalmers has introduced a
ghtweight epoxy resin current
ansformer (Type TWM) for in-
oor-outdoor light-duty metering.
esigned in four current ratings—
0:5, 400:5, 600:5 and 800:5; it may
e mounted vertically, horizontally,
r inverted. Easily adapted for con-
uit type hookup, it may be used
two or three wire, single and
lyphase circuits. Can accommo-
ate two 750 MCM or three 500
CM cables.

Circle item #28 on reply card

something extra...

that's what you want in a fuel...

what you get in B&O Bituminous!

Sure, bituminous coal is power-packed—it's prepared to suit any industrial utilization—its source is most convenient to industry. But, bituminous gives you the *extra* that no other fuel can—*nearly inexhaustible reserves, always available!*

B&O

BITUMINOUS COALS FOR EVERY PURPOSE

Ask our man! BALTIMORE & OHIO RAILROAD
BALTIMORE 1, MD., Phone: LExington 9-0400

Designed and engineered specifically for tension stringing . . . lightweight — extremely rugged.

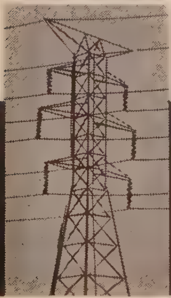
Sheave has permanently bonded Type GNA **Neoprene lining** — provides maximum protection to conductor. Sheave is mounted on shielded ball bearings.

All high strength aluminum alloy rib reinforced construction with built-in conductor guard and handles. Drop forged fittings. Safety locking, hinged side strap.

35,000 lbs. ultimate strength.
Sizes through 28" diameter . . . for all conductors through 1,780,000 C.M.

Complete Catalog on Request

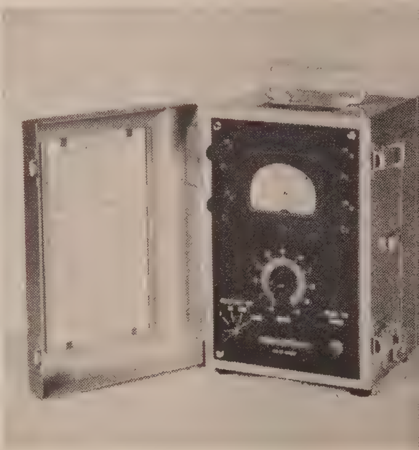
Sherman & Reilly, Inc.
ENGINEERS AND MANUFACTURERS
First and Broad Streets
CHATTANOOGA 2, TENNESSEE
Telephone AMherst 7-1273



Resistance Test Set

A series of instruments for measuring the resistance of electrica grounds in power circuits has bee announced by **Associated Research Inc.** Vibroground series include three models which provide direc readings. Light weight, self-contained, battery-operated vibrato power supply has improved por ability and dependability. Range as low as 0-300 ohms and up to 3000 ohms.

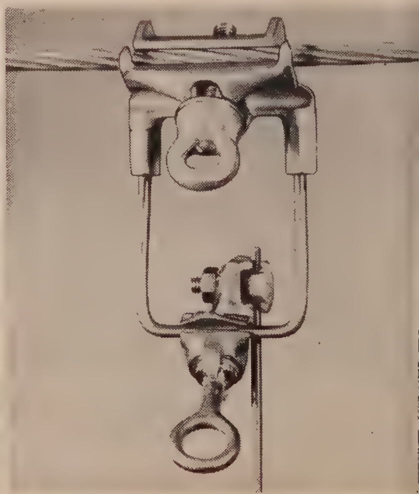
Circle item #29 on reply card

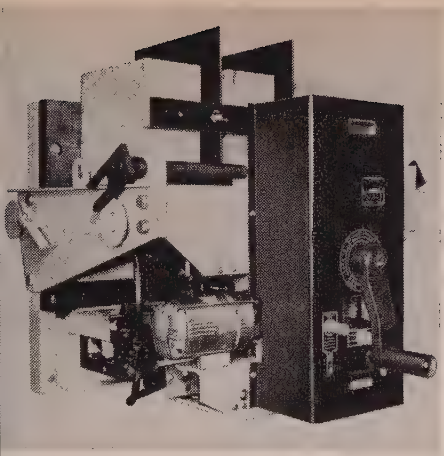


Stirrup Clamps

Available from **Bodendieck,** series of stirrup clamps which ca be applied to primaries with h sticks feature simplicity and rel ance on proven design. All mode have same line sizes. All bails a formed of bar stock and the en are coated with connection grea before being compressed in wi hex dies on a 40-ton punch pres Available in aluminum or copp base alloy models.

Circle item #30 on reply card

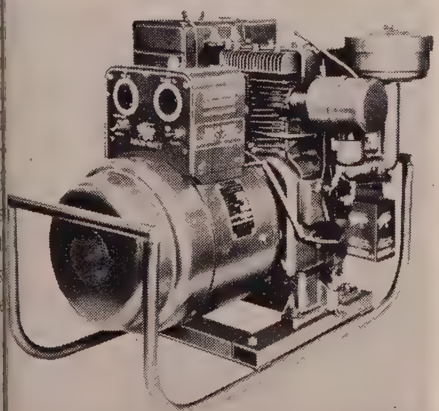




Closing Mechanism

Amplitork stored energy closing
mechanism which insures positive
closing even under maximum fault
conditions is available on **Allis-Chalmers** line of low voltage switch-
gear, 5- and 15-kv metal clad
switch-gear, and frame mounted oil
circuit breakers. Assures fast clos-
ng to guard against arcing and con-
equent contact erosion, even when
lectro-magnetic forces tend to op-
ose positive opening.

Circle item #31 on reply card



ngine Generators

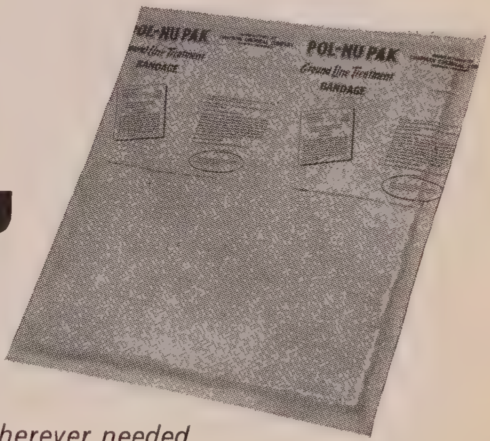
Maxi-watt design incorporated in
inco® engine generators provide
aximum power for heavy induc-
ve load beyond the effective ca-
acity of other generators of like
ze. Rated at 4000 watts, they will
art a 3 hp motor under full rated
ad, or will carry a 4000 watt load
lights on a single 115 or 230 v
rcuit. Idler control provides fuel
vings. Available in electric, man-
al or remote starting models.

Circle item #32 on reply card

Now line crews can apply ground-line pole preservative

CHAPMAN®

POL-NU PAK

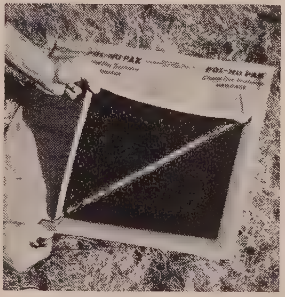


Convenient, envelope-type ground-line treatment bandage for quick application wherever needed

Enlist your line crews in a system-wide effort to get longest service life from standing poles. With Chapman Pol-Nu Paks carried as standard equipment on service trucks, crews can apply ground-line preservative treatments to poles.

This convenient pole preservative bandage comes as a factory-sealed envelope containing Chapman Pol-Nu, the original grease-type pentachlorophenol preservative. Applied as shown in the steps below, it prevents errors and assures adequate Pol-Nu at the ground-line to restore natural loss of preservative in this critical area, resulting in many years of additional pole life.

Pol-Nu Paks are available in several sizes and, because of their convenience, are sometimes preferred for all ground-line treatment work. However, Chapman Pol-Nu in bulk containers and the Pol-Nu Bandage-Maker for preparing pole bandages in the field offer economies where many poles are to be treated. For information on both methods, using your own crews or contractor-applicators, mail the coupon below.



Slit Pol-Nu Pak on three sides to expose preservative.

Wrap bandage around pole at ground-line and staple.

Back-filling completes job, assuring longer pole life.

CHAPMAN CHEMICAL COMPANY
Leading manufacturer of wood preservatives • Memphis 1, Tenn.
Palo Alto, Cal. • Portland, Ore. • Minneapolis • Charlotte, N. C.

CHAPMAN®
POL-NU PAK

MAIL COUPON FOR COMPLETE DATA
Chapman Chemical Company
P. O. Box 138, Memphis 1, Tenn.
Please send data on Pol-Nu Pak and information on extending pole life to:

*Name*__________
*Company*__________
*Address*__________
____

Crapo

GALVANIZED
STEEL STRAND
HAS ALL
5

- *1. Strength*
- *2. Workability*
- *3. Ruggedness*
- *4. Long Life*
- *5. Economy*

When you select a size and grade of strand for a specific job you want to know that it meets every requirement of that job. You want ample strength to sustain the ultimate load—plus an adequate safety factor. You want pliability for ease of working in the field. You want ruggedness to withstand the abuse which may be encountered during and after installation. You want long, dependable life. And, you want reasonably low first cost and low maintenance costs.

For more than 50 years *Crapo* Galvanized Steel Strand has consistently demonstrated its ability to more than meet all of these requirements. Proof of its reliable performance is to be found in the case histories of overhead power and communication lines throughout the country.

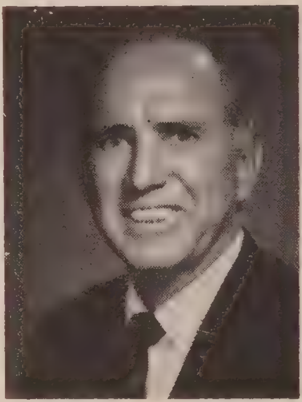
Crapo Galvanized Steel Strand is fully protected against corrosion by heavy, uniform, dense coatings of commercially pure zinc tightly bonded to the individual wires. All grades and sizes are available in A, B and C weights of coating.

For details, ask our distributor or write direct!

INDIANA
STEEL & WIRE
COMPANY, INC.
Muncie, Indiana

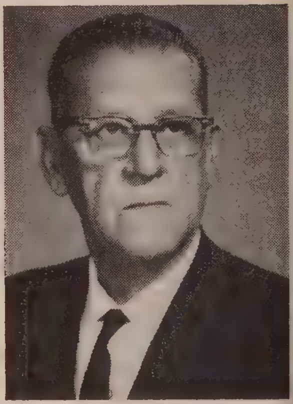
MEN OF POWER

Florida Power Elevates Two To Board, Elect VP



Gracy

McKean



Brumit

The Florida Power Corp. has increased its board to 11 members with the election of J. Shirley Gracy and H. K. McKean, senior vice presidents of the company. At the same time, Lawrence D. Brumit, acting comptroller, was named vice president and comptroller.

Mr. Gracy, who has been with the company since 1927, has executive responsibility for industrial relations, sales and division operations. He was first elected a vice president in 1947.

Mr. McKean has headed engineering activities for the company since 1946. He has been vice president in charge of operations since 1953.

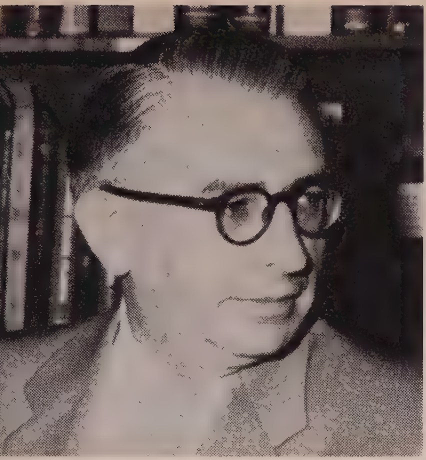
A 38-year veteran of the organization, Mr. Brumit has served as comptroller since early last year He previously had served as assistant comptroller for four years.

Fairman To Get Professional Engineers Award

James F. Fairman, senior vice president, Consolidated Edison Co., has been selected to receive the 1960 National Society of Professional Engineers Award for outstanding service to the profession.

Formal presentation of the award will be made at the Society's annual meeting in Boston, June 11.

The Award cites Mr. Fairman for his "outstanding performance and originality in utility system design and operation, responsible citizenship in national defense, pioneering leadership in the development of nuclear energy for peaceful purposes, and continued initiative in the advancement of the engineering profession.



Hemmenway To Arthur R. Mogge, Inc.

Donald L. Hemmenway, former senior technical editor of *Electric Light and Power,* has joined Arthur R. Mogge, Inc., as technical director.

Mr. Hemmenway will work particularly with electrical manufacturing accounts of the Chicago advertising agency.

A graduate of Northeastern university, Mr. Hemmenway spent many years in distribution engineering with electric utilities in New England. He joined Westinghouse Electric Corp. in 1945, where he served as an editor on the Westinghouse Engineer, and later, in technical publicity for that company. He moved to Electric Light and Power in 1951.

In his new position, he will act as technical advisor working on advertising and promotional materials for G&W, A. B. Chance, Wagner Electric, and Sangamo, long time clients of Arthur R. Mogge, Inc.

riffith Elected Riley Chairman

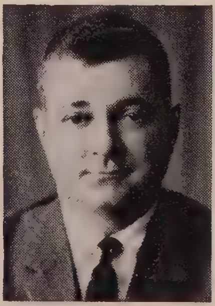
Louis E. Griffith was elected hairman of the Board at the 48th nnual meeting of stockholders of iley Stoker Corporation which as held recently. Mr. Griffith was enamed General Manager and lected Vice President in addition o Board Chairman.

Robert K. Griffith, formerly Vice resident and Treasurer, was elect- d President and Treasurer. He ucceeds Louis E. Griffith as Presi- ent.

Alexander L. Mitchell was ap- ointed a Vice President. He has ad charge of the Chicago Office, nd will now supervise operation f the Chicago, Cincinnati, Kansas ity, St. Louis and St. Paul offices.

L. E. Griffith
Chairman

R. K. Griffith
President



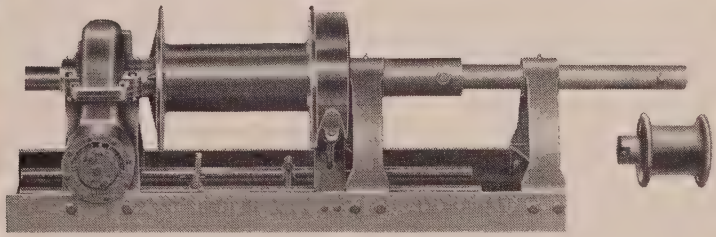
MEN OF POWER BRIEFS

TILITIES

George R. Woehler, vice presi- ent and comptroller of Southern diana Gas and Electric Co. has een elected to the board of direc- rs of the company. He succeeds **dmund F. Ortmeyer.**

SPECIALIZED TULSA® WINCHES FOR

PUBLIC



UTILITIES

Tulsa Utility winches are furnished with extended shaft and optional bayonet niggerhead. Safety factors are higher than S.A.E. specifications.
Gear box cover is removable from the top for easy inspection or dis-assembly when necessary, without removing utility body. Winch is manufactured of the finest materials and expert workmanship.
Sizes and models for all applications.
See your nearest Tulsa distributor.

TULSA WINCH
DIVISION OF VICKERS INCORPORATED
TULSA, OKLAHOMA

UTILITIES *(Cont'd)*

The board of directors of Merrimack-Essex Electric Co. has elected **Edward C. Bower** president of the utility. He succeeds **Newell A. Clark** who retired after 39 years service.

Oklahoma Gas and Electric Co. has named **James E. Mailer** vice president and Arkansas division manager. He replaces **Morgan Wright,** who retired. Also promoted was **Wayne A. Parker,** who becomes general superintendent of construction.

Willard S. Wilder, Electrical Engineer for Wisconsin Electric Power Co., has been named to the honorary grade of Fellow in the American Institute of Electrical Engineers, for "contributions to the direction of design of power plants, transmission and distribution facilities of a large public utility."

R. N. Robertson has been promoted to director of the residential development department of the Florida Power Corp. He succeeds **C. W. Ailstock,** who retired after 31 years in sales work for the Florida utility.

Harold P. Rodes, president of Bradley University and **Q. W. Wellington,** vice president of operations, Central Illinois Light Co. have been elected to the Illinois utility's board of directors.

Newest director of the Southern Indiana Gas & Electric Co. is **George R. Woehler,** vice president and comptroller of the company. He has been with the utility for 40 years.

Thomas Mickewich has been named to succeed **Harvey C. Patterson** as manager of the Skowhegan District of Central Maine Power Company. Mr. Patterson retired after 50 years of service.

Central Hudson Gas & Electric Corporation has announced that **Jack A. McEnroe** has been appointed assistant treasurer of the company.

Walter G. McKie, general sales manager of Rochester Gas and Electric Corp. and chairman of the Better Light Better Sight Bureau has announced that **Arthur C. Barr,** manager of product planning and development, G-E Large Lamp Department, has been appointed to the executive committee of the bureau. Others on the executive committee include **J. T. Coatsworth,** EEI; **E. O. George,** Detroit Edison; **L. P. Pleasants,** Sylvania Lighting Products; **H. E. Plishker,** Westinghouse; and **H. A. Stroud,** Monongahela Power Co.

Miss Ruth Morris, home lighting specialist, Georgia Power Co., and **S. J. Andre,** sales engineer for the company's Atlanta division, have been named Georgia section winners of the Illuminating Engineering Society's annual lighting contest.

Lowell P. Mickelwait has been elected to the board of Puget Sound Power & Light Co.

B. C. Electric has announced the promotion of **Ted Collins** to the post of superintendent of electric generating stations. He fills the job vacated by the retirement of **Clarence Arnott.**

Marion G. Miller, vice president of West Penn Power's parent company, The West Penn Electric Co., has been elected to the board of the subsidiary organization.

Three executive changes have been made by Central Hudson Gas and Electric Corp.: **Edwin T. Strong** has been appointed manager of new business development division, **Roland C. Becker** is assistant to the vice president, and **William E. VanWagenen** has been named district resident manager for the Poughkeepsie and central, northern, and eastern Duchess county areas.

Vice President **Vincent P. McDevitt** has been elected to the board of the Philadelphia Electric Co.

Northern States Power Co. has appointed **James E. Stoddard** sales manager—St. Paul division.

CONSULTANTS

John B. Kelly has been appointe assistant to the executive vice pres ident at Burns and Roe, Inc. In ad dition to other duties, he will co ordinate foreign operations of th company.

Fred W. Argue, President Ston & Webster Engineering Corpora tion, has announced the appoint ment of **George W. Letteney** as as sistant treasurer of the company. H is an 18-year veteran with Stone & Webster.

At Ebasco, Services Inc. **M. I Clough** has been named northeas regional manager, operating out c the New York office. At the sam time, **Robert Breckenridge,** senio marketing consultant, and **Rober W. Self,** insurance consultant, hav joined the staff.

Frank Freeland has joined th rate department of Commonwealt Services, Inc.

MANUFACTURERS

William J. Herrmann is the ne general manager of the Tulsa Winc division of Vickers Inc.

Norman E. Shipley has been ap pointed sales manager of th Thomas Works, H. K. Porter Cc Inc.

Recently elected vice president Hathway Instruments, Inc., w **Warren D. Tilton.** He is also gener manager of the Denver division.

J. C. Friedrich has been name vice president in charge of man facturing of the James R. Kearn Corp.

The Kuhlman Electric Co. h announced the appointment of **Pe E. Taylor** as southern regional ma ager. He will headquarter at Ra mond, Miss.

Better Light Better Sight Bure has announced the appointment **Arthur C. Barr** to the executi committee. He is manager of pro uct planning and development G-E's large lamp division.

(Continued on page 130)

Recognize Lower Noise-Level Needs

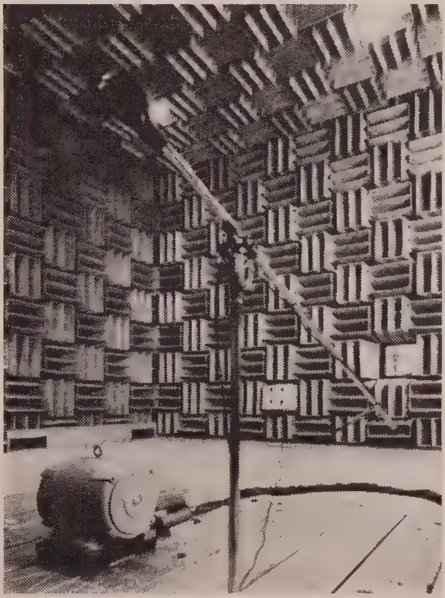
Westinghouse Tests for Future Requirements

To meet present and future needs or reduction of vibration and noise manating from rotating electrical quipment, Westinghouse Electric Corp. has constructed a 30- by 30- y 18-ft semi-anechoic chamber vhich will accommodate motors up o 1500 hp. The sound room is quipped with instruments and acessories to measure and record oth sound pressure and vibration lata down to extremely low values.

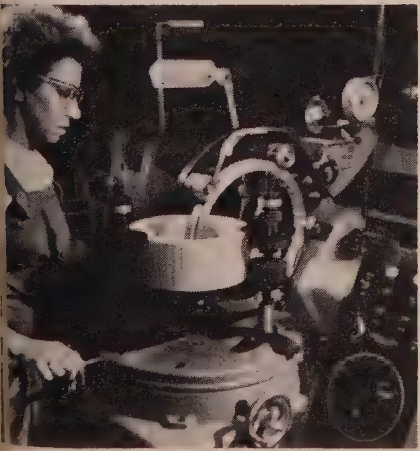
The new facility is designed with 'iberglas wedges to absorb the nergy for the frequency compoents above 100 cps, the lowest freuency of any major importance on lectric motors.

The motor under test is isolated rom the test floor and walls by an nertial block which has a mass nany times that of the machine. he inertial block also provides a oundation with very low ambient ibration, necessary for accurate ibration measurements. The block as a natural frequency of four cps, eighs 70 tons, and is dimensioned that the test equipment can be entered in the chamber.

The room is provided with facilies for handling 5000 cfm of filered air. Sound traps prevent venlator or blower noise from entering the chamber while a continuous strip-type filter insures the presence of clean, pure air.



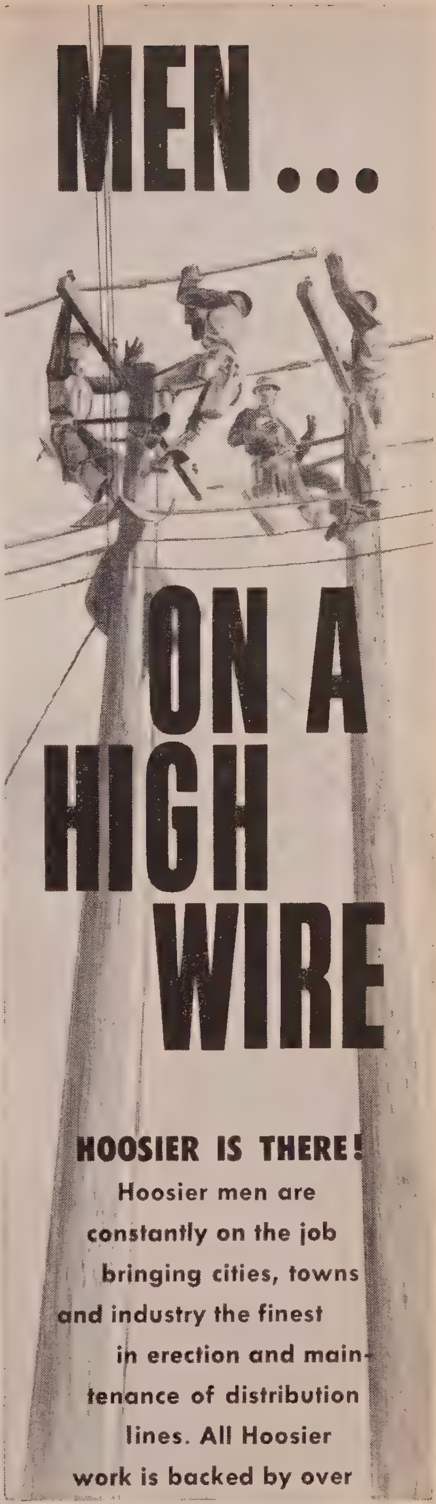
The instrument room adjacent to the chamber contains all the equipment necessary to gather and record the basic data. By use of sound and vibration calibrators along with an analyzer, containing filters which can be selected down to a pass band of two cps, and a digital counter, it is possible to accurately determine the frequency components and their magnitude.



Instrument Transformer Production Expedited By A-C

Production of quality instrument transformers has been expedited at Allis-Chalmers Pittsburgh Works with the installation of several new toroidal winding and taping machines.

This precision equipment can fabricate various size transformer coils ranging between 14 inch OD down to 1½ inch ID. Its versatility also includes simultaneous winding of two different sizes of wire.



MEN...

ON A HIGH WIRE

HOOSIER IS THERE!

Hoosier men are constantly on the job bringing cities, towns and industry the finest in erection and maintenance of distribution lines. All Hoosier work is backed by over 40 years of continuous, dependable service to the electrical industry and its consumers.

HOOSIER
ENGINEERING CO.
1350 HOLLY AVE. • COLUMBUS 8, OHIO

Copes-Vulcan Expands

Continuing growth has forced the expansion of manufacturing facilities of the Copes-Vulcan division of Blaw-Knox Co. The division is moving into additional leased space formerly occupied by the Erie Resistor Co. plastics division in Erie, Pa.

Production of some of the parts for Copes-Vulcan's line of power plant equipment and of valves for nuclear power installations are being transferred to the new location. Division offices and principal manufacturing facilities remain in the current location.

PRODUCTION BRIEFS

C & D Batteries' plant in Pennsburg, Pa., has been expanded to develop and manufacture automatically regulated power sources. E. E. Moyer has been selected to head research and development at the expanded plant.

The first distribution transformer plant to be built in Texas by a major manufacturer is scheduled to be opened about June 15. According to Clyde W. Shaw, executive vice president of the **R T & E Corp.**, the company expects that the southwest market will offer this plant double the growth potential of any of the firm's manufacturing facilities.

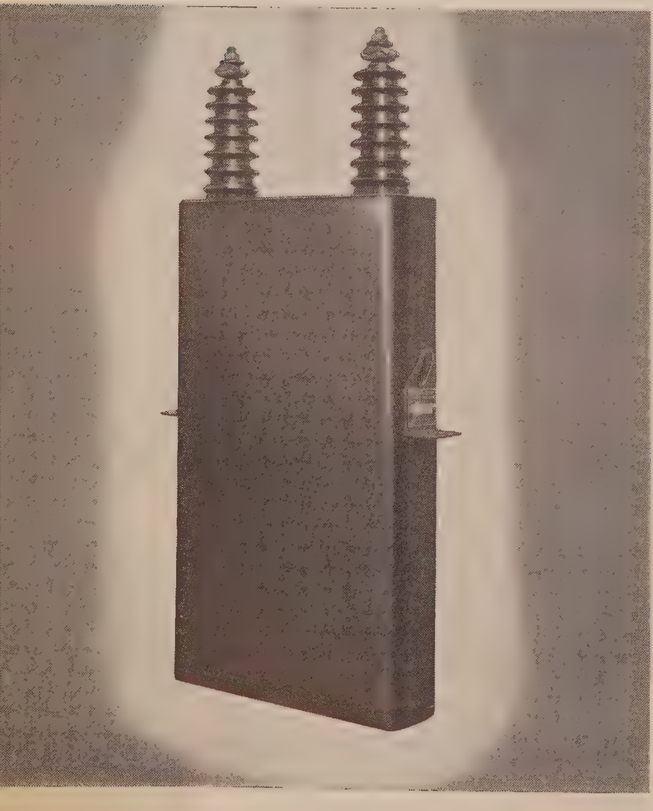
Edwin L. Wiegand Co., manufacturer of Chromolox electric heating elements and equipment, has acquired Barber Infared Associates as a subsidiary. The new division will be known as Radcor, Inc. The new facility will specialize in the production, design, and applicatio of complete electric infared oven low temperature furnaces, radian space heaters, fluid heat-transfe systems, and asphalt heating equip ment.

Sales Briefs

Federal Pacific Electric Co. is mov ing its Boston Customer Servic Center to expanded facilities i Norwood, Mass. The new facilit will house integrated engineerin field service, production, warehous ing, and sales departments servin local electric equipment markets i New England.

Kerrigan Iron Works Co., manufac turer of lighting standards an equipment, and a subsidiary Rockwell-Standard Corp., has a nounced the following new repre sentatives: **Berry-Rochi, Inc.**, Lon Island City, N. Y., to cover Ne York City and Long Island; **R.**

G-E "COMPACT ISOKRAFT* 50" CAPACITORS OFFER



*Trademark of the General Electric Co.

1200 KVAR, U

General Electric's new "COMPACT IS KRAFT 50" capacitors help speed equipme installation. These new 50-kvar units, the lighte and smallest available, make possible a switch 1200-kvar, three-segment cluster equipme weighing only 2300 lbs. Designed for installati flexibility, the equipment is suitable for install tion in three segments or it can go up the p in one piece. The heaviest segment weighs le than 900 lbs.

Available in 900- and 1200-kvar ratings, t new three-segment cluster equipment takes le time to install. Capacitor units are factory asse bled and wired in three racks. Each rack c tains all of the capacitors in one phase. Only t

Mitscher Co., Inc., Buffalo, N. Y., for New York state; **Baynes, Inc.,** Hartford, Conn., Connecticut and southwest Massachusetts; **P. M. Dreyfuss & Son,** New Shrewsbury, N. J., for New Jersey; **J. J. Gorman Co.,** Detroit, for the state of Michigan; **Charles C. Laney Agency,** Richmond, state of Virginia; and **C. D. White Co.,** Boston, for the New England states.

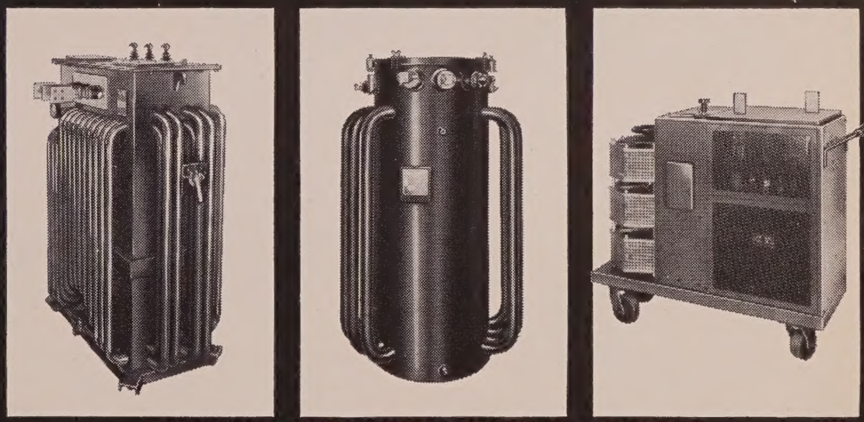
Harold L. Rush, Doraville, Ga., has been appointed sales representative for **RT&E Corp.** He will represent the company in Tennessee and the upper two-thirds of Georgia.

Charles Roberts Associates Inc., marketing and distribution consulting firm, has become affiliated with **Ebasco Services Inc.** The new firm will continue to operate under its present name and from the present location in New York. The services of the new affiliate will complement those provided by Ebasco's management consulting division in sales, marketing, and public relations.

Eisler

IMPULSE TESTED TRANSFORMERS

Eisler has built transformers of all types for 38 years, and there's a complete range available up to 500 KVA. Our engineering staff will welcome the opportunity of working with you on your standard and special requirements.



DRY TYPE and LIQUID FILLED • STANDARD and SPECIALS

EISLER TRANSFORMER COMPANY, INC.
Division of Eisler Engineering Co., Inc.
20 NORTH SALEM STREET, DOVER, NEW JERSEY

IN ONE PIECE

connections between the three phases, line connections, plus control power connection for switched equipments are required in the field. Switched equipments include three, single-phase capacitor switches and a control wiring junction box mounted on the center segment.

For complete information, contact your nearest G-E Apparatus Sales Representative, or write for bulletin GEA-7061, to General Electric Company, Section 445-33, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

P & K OUTDOOR LIGHTING REPORT
the Modern Trend in LOW LEVEL LIGHTING
RATH PARK

TOP PHOTO: Location: Fairleigh Dickinson University, Madison, N. J. • Electrical Consultant: H. L. Sykes
LOWER PHOTO: Location: Rath Park, Franklin Square, L. I., N. Y. • Architect: Herbert D. Phillips
Consulting Engineers: Barstow, Mulligan & Vollmer

P&K CIRCLElux DAVITS & POSTS

modern lighting at a realistic cost

Here are two contemporary outdoor lighting installations — one an all new municipal swimming pool and recreational area — the other, a prominent New Jersey University. Both chose the P&K all aluminum CIRCLElux lighting package to illuminate and compliment their roadways, walkways, landscape and architecture.

The sweeping lines of the P&K CIRCLElux davit blend with the modern one story architecture of the Rath Park Swimming Pool. Yet, the modern, but stately, design of the P&K CIRCLElux post is in good taste with the traditional architecture of Fairleigh Dickinson University. The CIRCLElux lighting package is the correct low level lighting choice to compliment almost all types of architecture.

The P&K CIRCLElux is available in a wide range of davit styles and mounting heights. The post is available in one basic design but at various mounting heights and with the CIRCLElux you have a choice of three light sources — incandescent, mercury vapor and fluorescent. This combination of luminaires and davits or posts will enable you to specify "packaged" lighting units. This means easier specifying by using matched components which in turn can customize your lighting projects.

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P&K

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Recently elected vice president at Westinghouse Electric Corp. ar **Marshall K. Evans,** named vic president and director of management services, and **P. T. Lagrone** named vice president in charge o the company's southeastern region

Alco Products, Inc., has announced the appointment of **Dr Walter K. Stromquist** as chief o plant systems engineering in th company's nuclear power engineering department. He will be responsible for the design of component and instrumentation for the primary and secondary systems of nuclear power plants.

The appointment of **John F. McKiernan** to the position of distric manager of the eastern territory fo the Triangle Conduit & Cable Company has been announced. In thi new capacity, Mr. McKiernan, formerly applications and sales engineer for the North Central Distric will handle the sale of the company's electrical wire cable and conduit products in this area.

Marvin Gunter has been appointed district manager of Microwav & Industrial Product Sales for Motorola Communications & Electronics, Inc., for the southern states.

HELP WANTED

UTILITY ENGINEER-ECONOMIST —Graduate engineer with analytical experience in public utility economics, rates and regulation; for semi-senior position in consulting engineering office. Location New York City. Address Box 5151, ELECTRIC LIGHT & POWER, 6 No. Michigan Ave., Chicago 2, Illinois.

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. . . To The Editor

ear Mr. Garrett,

Having read your editorial in ectric Light & Power for April 1960, I am interested in bringing is to the attention of the Editorial aff of Spartan Engineer, a student iblication on the Michigan State niversity Campus.

The Spartan Engineer is edited students of the Engineering Col- ge, who are attempting to develop eir journalistic abilities as extra irricular work. I have the priv- ege of being Alumni Advisor to e staff.

Your editorial so well sets forth e ideas, which I have attempted convey to the staff of Spartan ngineer, that I would not only like call it to their attention but ould request permission to have em quote from it in their publica- on.

Will you kindly grant such per- ssion.

H. J. Plumb
Consumers Power Company

rmission granted. We hope the artan engineers of the future take problem to heart. We need more gineers who can write intelli- ntly.

•

ar Mr. Garrett,

May I call attention to an error in ur April EL&P News and Per- ective. In the item on Page 7 of t issue, under Management w, telling about our application a lower rate for school and rch heating, you use the figure 5-cents for each kwh . . . " The rect figure as shown in our re- se is 1.5 cents.

Robert B. Van Atta
Supervisor of Publicity
West Penn Power Company

•

ar Mr. Garrett,

was glad to see on your April sue, the reprint of the cover of Bridge of Eta Kappa Nu's re- t number. The education of the ineer-Scientist—prepared to t the challenges of the future— st differ markedly from the ex- ng pattern. Mr. Schroeder's cov- s a help in this direction!

Pierre M. Honnell
Professor
Washington University

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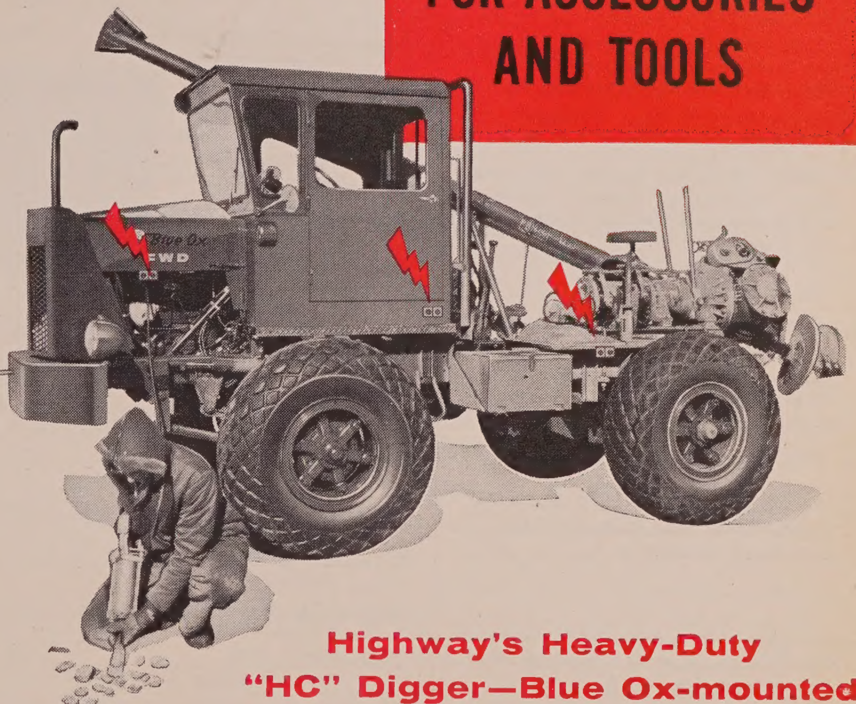

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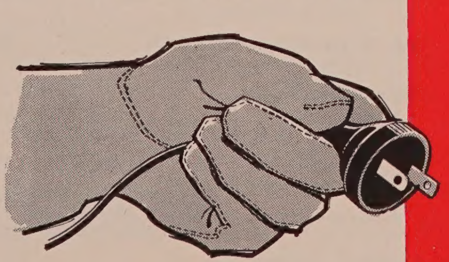

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CALENDAR OF EVENTS

May 19-20—Pennsylvania Electric Association, Transmission and Distribution Committee, Berkshire Hotel, Reading, Pa.

May 23-25 — Northwest Electric Light and Power Association, Business Development Conference, Chinook Hotel, Yakima, Wash.

May 24—Electric Companies Public Information Program, Mid-Atlantic Regional Meeting, Rochester Gas and Electric Corp.'s Employee Center, Rochester, N. Y.

June 2-3—Southeastern Electric Exchange, Industrial Power Sales Conference, Battery Park Hotel, Asheville, N. C.

June 5—Electric Companies Public Information Program, Steering Committee Meeting, Atlantic City, N. J.

June 6-8—Edison Electric Institute, Annual Convention, Atlantic City, N. J.

June 15-17—National Committee for Utilities Radio, 1960 Annual Meeting, St. Petersburg, Fla.

June 19-24—American Institute of Electrical Engineers, Summer General Meeting, Chalfont-Madden Hall, Atlantic City, N. J.

September 7-9—Northwest Electric Light and Power Association, Annual Convention, Glacier Park Lodge, Glacier National Park, Mont.

September 28-30—Indiana Electric Association, 51st Annual Convention, French Lick-Sheraton Hotel, French Lick, Ind.

October 5-7—Wisconsin Utilities Association, Electric and Gas Sales and Operating Sections Convention, Schroeder Hotel, Milwaukee, Wisc.

October 9-14—American Institute of Electrical Engineers, Fall General Meeting, Morrison Hotel, Chicago, Ill.

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